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This document contains summaries of six courses presented at the Second Annual Presessions of the American Educational Research Association (1) Bayesian statistical analysis, (2) curriculum research and evaluation, (3) design and analysis of comparative experiments in education, (4) educational research management procedures, (5) multivariate design and analysis in educational research, and (6) research strategies with culturally deprived children. Each summary provides an introduction, a statement of objectives, a listing of the presession staff, a listing and description of participants, a schedule of activities, an example or list of materials utilized, and presession evaluation instruments. Following the final report are a summary and recommendations made by the program director. (TT)

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1967 AERA PRESESSIONS

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AERA
1967
PRESESSIONS

Director

RICHARD E. SCHUTZ

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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INTRODUCTION

The Second Annual Presessions of the American Educational Research Association included six courses:

I. Bayesian Statistical Analysis
    Instructor: Donald Meyer

II. Curriculum Research and Evaluation
    Instructors: Robert L. Baker
    James Popham
    Howard J. Sullivan

III. Design and Analysis of Comparative Experiments in Education
    Instructors: Gene V. Glass
    Kenneth D. Hopkins
    Jason Millman

IV. Educational Research Management Procedures
    Instructors: Desmond Cook
    Edwin Hindsman

V. Multivariate Design and Analysis in Educational Research
    Instructors: Joe Ward
    Earl Jennings
    Robert Bottenberg
    Deene Gott

VI. Research Strategies with Culturally Deprived Children
    Instructor: Martin Deutsch

The courses were organized and structured to cover the educational research terrain as comprehensively as possible and to provide instruction that would be suitable for research novices as well as for experienced researchers. Considerable effort was given to the selection of the six topics.

In the fall of 1965 a mail survey was conducted involving a stratified random sample of 125 AERA members to obtain suggestions from the membership concerning topics. The results of the survey failed to support the hypothesis that persons most needing training are most qualified to specify the training they need. However, the survey did yield some usable suggestions. Notices in the _Educational Researcher_ also solicited ideas. Members of the AERA Executive Committee were very helpful in suggesting ideas.

Since official notice of USOE financial support of the project was not received until December 1966, publicity for the presessions was limited to announcements in the Educational Researcher and to a direct mailing of applications to the AERA membership in mid-December 1966. Altogether 495 completed applications were received. The number of applicants exceeded conventional class size for each session. However, courses I, II, and IV admitted all applicants indicating the course as their first choice. The maximum size of the other courses was established in consultation with the instructor of each course. Selections were made by the course instructor. The number of persons listing the course as their first choice and the number of actual participants are shown below.

Course	Participants	Applicants
I	51	60
II	59	75
III	65	140
IV	53	60
V	44	70
VI	50	90
	322	495

Each instructor was totally responsible for the conduct of his course, including the evaluations which follow. With one exception, the results of the formal evaluation indicate that, in general, the participants both learned from and liked the training they received.

It must be borne in mind, that as a result of extremely late funding and a lack of support for program evaluation, adequate staffing, and report preparation, this final report varies considerably from presession to presession. Where directors found other support for their time and materials, the reports are of excellent quality and will hopefully be models for future substantive presession reporting. Each presession is dealt with as a single chapter and may provide an introduction, a statement of objectives, a listing of the presession staff, a listing and/or description of participants, a schedule of activities, an example or list of materials utilized, presession evaluation and/or evaluation instruments, and in one case (Presession III) a summary and statement of recommendations.

A brief overall statement of summary and recommendation is made by the Presessions Program Director, Richard E. Schutz following the final Presession report.

ANNOUNCEMENT

AMERICAN EDUCATIONAL RESEARCH ASSOCIATION
RESEARCH TRAINING PRESESSIONS

February 11-15, 1967

The American Educational Research Association, aided by a grant from the Bureau of Research, U. S. Office of Education, will conduct six intensive training courses in various aspects of educational research in connection with the 1967 Annual Meeting. A description of each course is given on the following pages.

Application: An application form is enclosed. Applications received prior to December 1, 1966 will be reviewed and notification of acceptance will be mailed to applicants on December 16, 1966. Applications received after December 1 will be processed, but acceptance will be contingent upon space limitations and enrollment figures prior to December 1.

Eligibility: As indicated in the description of each course, AERA membership is not an enrollment requisite.

Location: Each course will be conducted at a location within New York City with the exception of Course III: Design and Analysis of Comparative Experiments in Education, which will be conducted at Grossinger's Resort in upstate New York. Rooms for the New York City participants will be available at convention rates at the Statler Hilton Hotel, the site of the Annual AERA Meeting. The total cost to each Course III participant for room and meals for the five days at Grossinger's resort hotel will be less than $120.

Tuition Costs: None. Purchase of a text may be required for some courses.

Additional Details: Lodging applications and further details concerning each course will be mailed to participants with notification of acceptance. Address special inquiries to the chairman of the presession committee, Dr. Richard E. Schutz, 11300 La Cienega Blvd., Inglewood, California 90304.

APPLICATION FORM

AERA 1967 Presession Application

February 11-15, New York City

Return completed application to Dr. Richard E. Schutz, Southwest Regional Laboratory, 11300 La Cienega Blvd., Inglewood, California 90304

Presession Choice

Indicate your preference using the following code:

1 - First choice
2 - Would attend if application accepted
N - Do not wish to attend

___ Bayesian Statistical Analysis
___ Curriculum Research and Evaluation
___ Design and Analysis of Comparative Experiments in Education
___ Educational Research Management Procedures
___ Multivariate Design and Analysis in Education Research
___ Research Strategies with Culturally Deprived Children

General Information

Name____ Age ____ Female ______
Last First Initial
Male ______

Home Address ____
Number Street City State

Office Address ____
Number Street City State

Address for Reply (Please check one): ____ Home ____ Office

Present Institutional Affiliation (e.g., Harvard, Norfolk Public Schools):

____

Employment Responsibilities

Describe briefly the nature of your present employment:______________________

____

What percent of your time is allotted to teaching?____________________.
What percent of your time is allotted to research?____________________.
Which courses do you teach (if any) and at what level (Undergraduate or graduate)?

Course	Level (Circle one)
____________________	Graduate Undergraduate
____________________	Graduate Undergraduate
____________________	Graduate Undergraduate
____________________	Graduate Undergraduate

Approximately how many advisees do you have at the undergraduate level _____, at the graduate level ____?

Educational History

Baccalaureate School ______________________________ Year of Degree _____ Major__________
Doctoral School ______________________________ Year of Degree _____ Major__________

Check those courses in which you have earned either undergraduate or graduate credit:

	Undergraduate	Graduate
a. Statistical Methods	_____	_____
b. Educational and Psychological Testing	_____	_____
c. Research Methods	_____	_____
d. Psychometric Methods	_____	_____
e. Calculus	_____	_____
f. Mathematical Statistics	_____	_____
g. Probability Theory	_____	_____

Professional and Scholarly Activities

What are your primary research interests? ____
____

How many research articles which you have authored alone or jointly have been accepted in a scholarly (refereed) journal? _______

How many funded (by USOE, NIMH, Ford Foundation or other granting agencies) research projects have been completed on which your name appears as either the first or a joint author? _______

Have you presented a paper or appeared on a panel at the annual convention of either AERA, NCME, NSCTE or AACTE within the last three years? _____ NO _____ YES

Do you anticipate reading a paper at such a convention within the next three years? _______ NO _______ YES

List in their order of importance to you, no more than three professional societies (e.g., AERA, American Psychological Association) of which you are a member:

(1) ______________________________________
(2) ______________________________________
(3) ______________________________________

Additional Information

Please offer any information concerning your interests, responsibilities, reasons for applying, etc. which might assist the committee in reviewing your application.

ABSTRACTS OF THE 1967 AERA PRESESSIONS

BAYESIAN STATISTICAL ANALYSIS
Course I

1. Instructors: Donald Meyer, Syracuse University
   (One additional instructor and one assistant to be added)

2. Participants:

   This session will be open to individuals who hold a doctorate and whose academic responsibilities involve designing educational research studies, analyzing research data, utilizing research results for making decisions about future educational practice, or teaching courses in educational research and statistics.

3. Objectives: Participants will be able to:

   a. Apply a Bayesian approach in designing educational research studies.
   b. Perform Bayesian statistical analyses of educational research data.

4. Tentative Structure:

   Instruction in the form of lectures, prepared handouts, and exercises will be announced with the following major topics:

   a. Elementary probability theory and Bayes theorem.

   b. Philosophical foundations of Subjective Probability.

   c. Application of theory to Binomal Sampling -- Estimation and Hypothesis Testing.

   d. Bayesian analysis of Linear Models

   e. Miscellaneous Topics

      1) Multiple comparisons

      2) Contingency analysis

CURRICULUM RESEARCH AND EVALUATION
Course II

1. Instructors:

Robert L. Baker, Arizona State University
James Popham, University of California, Los Angeles
Howard J. Sullivan, Southwest Regional Laboratory for Educational Research and Development

2. Participants:

This session is designed for school and university personnel holding doctoral degrees and having responsibility for the formulation and evaluation of curricular programs.

3. Objectives:

Participants will be able to:

1. Specify the desired outcomes of curricular programs in terms of observable learner behavior.

2. Describe in operational terms the planned classroom transactions for a given curricular program.

3. Specify appropriate independent and dependent variables for an experimental study, and state the specific relationships to be investigated in the study.

4. Select the most valid and practical experimental design for investigating the specified relationships.

5. Construct and/or select valid instruments to measure the extent to which the desired outcomes of curricular programs are attained.

6. Prepare a research proposal which adequately describes the problem and experimental plans.

4. Structure:

For each objective listed above, a handout of instructional notes and one or more sets of exercises will be prepared. The normal instructional procedure will employ in order a series of carefully sequenced instructional sessions related to one of the six objectives listed above, exercises designed to elicit the behavior specified in that objective, and instructional feedback for performance on the exercises. A pretest and post-test will be administered to measure degree of attainment of each of the stated objectives.

DESIGN AND ANALYSIS OF COMPARATIVE EXPERIMENTS IN EDUCATION

Course III

1. Instructors:

Director: Gene V Glass, University of Illinois
Kenneth D. Hopkins, University of Colorado
Jason Millman, Cornell University

2. Participants:

This presession will be open to persons who hold a doctorate in education and allied fields and whose primary academic responsibilities or interests are in the execution of educational research. The course it not intended for statistics and design specialists but for educational researchers who wish to extend their knowledge of design and analysis beyond the point it was left after perhaps no more than two statistics courses.

3. Tentative Structure:

a. Principles of Experimental Design and Analysis (Basic terms, control, randomization, precision, confounding, interaction, internal and external validity, etc.)

b. The Mathematical-Statistical Basis of Experimental Design and Analysis (Linear model, least-squares estimation, probability distribution, hypothesis testing, estimation, etc.)

c. Rules of Thumb for Writing the ANOVA Table. (Rules and mnemonic devices for determining sources of variation, d.f., SS, MS, and E(MS), in any ANOVA design)

d. Analysis of Unbalanced Designs (proportional sub-class frequencies, missing data, procedures for dealing with disproportionate subclass frequencies.)

e. Planned and Post-hoc Comparison (planned orthogonal comparisons, multiple comparison techniques, Tuken and Scheffé method, etc.)

f. Consequences of Failure to Meet the Assumption of the ANOVA (nominal and actual power and significance levels: non-normality: heterogeneous variances: nonindependence).

EDUCATIONAL RESEARCH MANAGEMENT PROCEDURES
Course IV

1. **Instructors**: Desmond Cook, Ohio State University
   Edwin Hindsman, Southwest Educational Development Laboratory, Austin, Texas

2. **Participants**:

   This session is planned for personnel having direct responsibility for planning and conducting educational research projects. It is anticipated that the majority of the participants will be principal investigators on individual research projects and administrative personnel from educational research bureaus and laboratories.

3. **Objectives**: Participants will be able to:

   a. Apply program budgeting techniques and cost-benefit analyses in planning research projects.

   b. Apply network planning techniques in managing research projects.

   c. Apply recently developed personnel management procedures in administering research projects.

4. **Tentative Structure**:

   a. Program budgeting concepts and exercises
   b. Cost benefit analysis principles and exercises
   c. Network planning concepts and exercises
   d. Scheduling concepts and principles--allocation of resources
   e. Management reports
   f. PERT applications in educational research and development

MULTIVARIATE DESIGN AND ANALYSIS IN EDUCATIONAL RESEARCH
Course V

1. Instructors:

Joe Ward, Personnel Research Center, Lackland Air Base
Earl Jennings, University of Texas
Robert Bottenberg, Personnel Research Center, Lackland Air Base
Deene Gott, Personnel Research Center, Lackland Air Base

2. Participants:

The session is designed for education researchers who have the basic statistical tools in their repertoire, but because of the rapid improvement of computer techniques for the systematic organization and analysis of data are presently unable to formulate research problems for computer analyses that will yield answers to the questions at issue.

3. Objectives:

The primary objective of this session is to assist the participants in developing techniques of formulating research problems for computer analyses so as to make full use of the multiple linear regression approach. Specifically, the participants will be able to:

a. Define vectors that express the conceptualization of a problem.

b. Formulate models appropriate for specific problems without conforming to experimental designs for which prescribed computational procedures are available.

c. Identify vectors that represent information that has been measured on a continuum.

d. Define vectors so as to express nonlinear and interaction relationships.

e. Use categorical and continuous vectors in models developed to remove the "contamination" of other factors (logic of covariance analysis)

f. Apply an ambiguous set of rules to the determination of the appropriate degrees of freedom to be used with the linear regression model.

g. Cite novel examples of research problems to which linear regression is applicable.

4. Tentative Structure:

This session is designed to develop the appreciation of multiple linear regression as a general approach to the formulation and analysis of research problems. As such, the activities will be divided about evenly between lecture-discussion, laboratory exercises related to the objectives listed and exercises related to appropriate computer operations.

Participants will have direct experience with data processing and computer equipment. Each participant will prepare a problem statement which reflects acquisition of concepts and development of the attendant techniques that are useful in conceptualizing research problems.

STRATEGIES OF RESEARCH WITH CULTURALLY DEPRIVED CHILDREN
Course VI

1. Instructors:

Martin Deutsch, New York University
(One instructor and one assistant to be added)

2. Participants:

This presession is designed for school and university personnel responsible for formulating, planning, conducting, and/or evaluating educational programs for culturally deprived children.

3. Objectives:

Participants will be able to:

a. Describe in operational terms the major causes of cultural deprivation and the social conditions associated with deprivation.

b. Specify the social conditions and causes of deprivation unique to each of the major groups of deprived peoples within the society.

c. Specify practical experimental treatments having a high probability of reducing or removing causes and conditions of cultural deprivation.

d. Specify research techniques and strategies appropriate for use in experimental research with culturally deprived children, and describe the application of the techniques and strategies to existing problems of culturally deprived groups.

e. Prepare a research outline that describes in operational terms the existing problem, the dependent and independent variables, and the experimental procedures in a proposed experimental study with culturally deprived children.

4. Tentative Structure:

The activities for this session will be divided into two types. One type will include classroom demonstrations, lectures, and exercises related to the objectives listed above. The second set will involve visitations to deprived areas of New York City conducted in cooperation with local agencies working with deprived groups, and consultation and interviews with representatives of such groups. The latter group of activities will provide the participants with an opportunity to observe directly the environmental conditions of deprivation among several deprived groups, as well as providing the opportunity to explore with representatives of deprived groups the underlying causes of these conditions and effective techniques of alleviating them.

PRESESSION I

BAYESIAN STATISTICAL ANALYSIS

Director

Dr. Donald L. Meyer
Syracuse University
Syracuse, New York

INTRODUCTION

Bayesian Statistical Analysis was a five-day training course designed for school and university personnel holding doctoral degrees who were engaged in the conduct of educational research. The purpose of the Presession was to provide formal training in the utilization of Bayes Theorem so that each participant might gain a basic understanding of the philosophical foundations of probability theory, the relation of Bayes theoren to elementary probability theory, its application to binomial sampling, and its utilization in linear analysis, multiple comparison, and contingency analysis.

This Presession was one of six intensive training courses in educational research sponsored by the American Educational Research Association aided by a grant from the Bureau of Research, U.S. Office of Education. The Presession was held on February 11-15, 1967, in connection with the 1967 AERA Annual Meeting.

OBJECTIVES

The objectives of the Presession were designed to enable participants who satisfactorily completed the program to:

1. Apply a Bayesian approach in the design of educational research studies.
2. Perform Bayesian statistical analyses of educational research data.

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SCHEDULE OF ACTIVITIES

Date	Session	Content
Saturday February 11	1.	Pre-test. Philosophical discussion of Bayesian and classical positions
	2.	Elementary probability theory including definitions of important concepts such as independence, sample spaces, conditional probability, etc.
Sunday February 12	3.	Bayes' theorem, definition and use in simple probability problems
	4.	Laboratory session on problems in the problem set
Monday February 13	5.	Definitions and use of loss and utility functions
	6.	Application of Bayes' theorem and loss functions in binomial situations
Tuesday February 14	7.	Natural Conjugate Bayes Densities, definition and examples in common sampling situations
	8.	Application of Bayes' theorem, loss functions and Natural Conjugate Bayes' Densities, to simple situations involving normal sampling
Wednesday February 15	9.	Laboratory session on advanced problems in the problem set
	10.	Advanced normal sampling situations (multiparameter, multivariate). Post-test.

MATERIALS: AN EXAMPLE PROBLEM SHEET AND ANSWERS

1. You are a counsellor advising a student about his chances of succeeding in a certain program.
   a. How might you estimate this chance?
   b. What is the relation between your subjective judgement and empirical frequencies?
   c. How is this like or unlike predicting from a regression equation?

2. Suppose you are doing a survey of attitudes and you question people one by one. The first ten people answer "yes" to question #1. What is your prediction about the next person's response to this question?

   "Evens" comes up ten consecutive times on a roulette wheel. What is your prediction about the next spin?

   Comment on similarities or differences between these two examples.

3. Two urns contain balls as follows:
   Urn 1. 5 green, 3 red
   Urn 2. 2 green, 3 red
   An urn is selected at random and one ball drawn from that urn.
   a. Define a sample space and assign probabilities.
   b. What is the probability of getting a green ball from Urn 1? From Urn 2?
   c. What is the probability of getting a green ball?

4. For the problem above, a ball is selected at random from each urn.
   a. Define a sample space and assign probabilities.
   b. What is the probability of a green ball from Urn 1 and a red ball from Urn 2.
   c. What is the probability of getting at least one green ball?

5. Two six-sided dice, one green and one red, are rolled:
   a. Find the conditional probability of obtaining a sum greater than 10, given that the red die resulted in a five.
   b. Find the conditional probability of obtaining a sum less than 6, given that the red die resulted in a 2.
   c. Find the conditional probability of obtaining a sum of 7 given that the red die resulted in a number less than 4.

6. In number 3 above find the conditional probability of obtaining a red ball given that Urn 1 was selected.

7. In number 3 above what is the probability that the ball came from Urn 1 given that a green ball was drawn?

8. Mr. Smith, having lived in his city many years, estimates the a priori probability that today's weather will be inclement is .2. (He thinks today will be fair with probability .8). Mr. Smith listens to an early morning weather forecast to get some information on the day's weather. The forecaster makes one of three predictions: fair, inclement, uncertain. Mr. Smith has made estimates of the conditional probabilities of the different predictions given the day's weather as shown below:

	Forecast		
Day's Weather	Fair	Inclement	Uncertain
Fair	.7	.2	.1
Inclement	.3	.6	.1

Suppose the forecaster predicts fair weather. What is the posterior probability of fair weather?

9. Suppose that the reliability of a chest X-ray test for the detection of T. B. is specified as follows: of people with T.B., 90% of the X-ray examinations detect the disease, but 10% go undetected. Of people free of tuberculosis, 99% of the X-rays are judged free of the disease, but 1% are diagnosed as showing T.B. From a large population of which only 0.1% have T.B., one person is selected at random, given a chest X-ray, and the radiologist reports the presences of T.B. What is the probability that the person has T.B.?

10. Suppose we are interested in testing between

$$H_0 \quad \pi = .25$$
$$H_1 \quad \pi = .75$$

and these are the only possible values for π, the population proportion of "successes".

   a. If a sample of 10 observations (x = success or failure) is going to be observed, what would the "classical" decision rule be if $\alpha = .05$?

   b. Suppose the prior distribution of belief were specified as follows:

π	$P(\pi)$
.25	.50
.75	.50

   The sample is taken and $x = 6$ successes are observed. What is the posterior distribution for π? Contrast this with (a).

11. For H_0: $\pi = .25$ and H_1: $\pi = .75$ as in #10, what is the gain in plausibility in "decibels" for H_1 for each success observed. What is the loss for each failure observed? (Note: $\log 3 \doteq .47712$ and $\log 2 = .30103$)

   a. Verify by using net gain in decibels that the Bayes factor for H_1 is slightly less than 10 if $x = 6$ and $N = 10$.

   b. How many successes would have to be observed in 14 trials to make the Bayes factor at least 100 in favor of H_1?

12. Suppose π is either .45, .50, or .55. The prior probabilities are .10, .80, and .10 respectively. (This could be an approximation to a prior for the probability of heads on a toss of an unknown coin.)
   a. Find the predictive probabilities for x = number of heads in 10 tosses.
   b. Would you be surprised if x = 9?
   c. What is the likelihood ratio for H_0: π = .50 against H_1: $\pi \neq .50$ if x = 9 successes are observed?

13. For testing H_0: π = .50 against H_1: π = .75 with N = 10, if a decision rule of reject H_o if x = 8, what are the α and β errors? If prior probabilities for H_0 and H_1 are equal, what is the implied loss ratio?

14. For H_0: π = .40, H_1: π = .80 the following loss table applies.

		Truth:	
		H_0	H_1
Decision	H_0	2	4
	H_1	8	1

   a. Find the regret table
   b. What is the minimax rule for n = 2 trials?
   c. If $P(H_0)$ = .3 and $P(H_1)$ = .7 what is the Baye's rule for n = 2? For n = 10?

15. Find the classical confidence interval for π if N = 10 and x = 3 using $1 - \alpha = .90$.

16. Suppose you have a rectangular prior over the values of π in our table. Find the .90 posterior probability interval for π if N = 10, x = 3. What is the mean of the posterior? What is the maximum likelihood estimator?

17. Hospital records indicate the 50% of patients having spinal anesthesia complain of post-operative headaches. A change in spinal fluid pressure has been observed in some patients but recent research seems to indicate that this may not be an important factor in causing headaches. From talking with patients, doctors, etc. and reading research a certain researcher feels quite strongly that a major factor is the attitude of the patient. The researcher designs a study involving 10 patients who are told that they will have to lie flat for 8 hours after the operation in order to minimize the headache which occurs after spinal anesthesia. The researcher feels that the reported incidence of headaches is sure to rise because the patient "expects" a headache. His prior distribution for π = proportion reporting headaches is:

π	$P(\pi)$
.50	.10
.60	.20
.70	.40
.80	.20
.90	.10

This is assuming these are the only possible values for π. Suppose patients report headaches. What is the posterior distribution for π ?

17. (cont.)

a. Graph the prior and posterior distributions.
b. What would the "classical" decision rule be for testing $H_0: \pi \leq .50$ against $H_1: \pi > .50$ at $\alpha = .05$?
c. What is the posterior probability of H_0?
d. What was the predictive probability of $x = 8$?
e. Suppose a further sample of 10 is contemplated. What is the predictive probability of observing another $x = 8$?

18. Suppose you estimate that the mean of your prior distribution for π is .20 and probability of $\pi > .40$ is .05.

a. Use our charts to find the parameters of a Beta density to represent the prior.
b. If a sample of 20 is taken and $x = 3$ observed, what is the posterior distribution?
c. Using our charts, construct a .95 posterior interval for π.
d. What is your point estimate of π ?

19. Suppose your are "indifferent" about π . What is your posterior beta density for π if $N = 20$ and $x = 3$? What is your best point estimate?

20. If your prior mean of π is .50 and your prior probability of $.40 < \pi < .60$ is .50, what prior beta distribution would apply?

21. For the prior in #20, suppose

$H_0: \pi \leq .50$
$H_1: \pi > .50$

with the following loss table:

"truth"

		H_0	H_1
Decision	H_0	0	4
	H_1	2	0

a. If you sample $N = 10$, what is the Baye's decision rule?
b. What is your expected risk:

22. For the prior in #20, what is the predictive probability of $x = 0, 1, 2$ in a sample of $N = 2$?

23. For #20, what is the expected number of successes for a sample of 10?

24. Suppose you feel that the probability of π being exactly .50 is .90. The remaining probability is spread over the range of π like a beta distribution with $n' = 30$ and $r' = 15$.

a. What is the Baye's factor for $H_0: \pi = .50$ against $H_1: \pi \neq .50$ if $N = 10$ and $x = 10$ observed?

25. Suppose you sample from a binomial population until the number of successes divided by the number of trials is greater than .50. If $N = 1{,}000{,}000$ and $x/n \leq .50$, you stop. Is this stopping rule "informative"?

26. An investigator wishes to ascertain if the sixth grade children of low income parents in a large city are below normal in intelligence. From a specified universe of children of a low income group, the investigator takes a random sample of 100 children and administers the Stanford-Binet. The sample mean is found to be 96. Assume that $\sigma^2 = 256$.

   a. Classical----Test the hypothesis that $H_0: \mu \geq 100$ against $H_1: \mu < 100$. Construct a .95 confidence interval for μ.

   b. Bayesian----The investigator has some suspicion that μ is below 100. His prior for μ is approximated by a normal distribution with mean = 92 and standard deviation of 8. Find the posterior distribution of μ. What is the $P(H_0)$ where H_0 is $\mu \leq 100$? Construct a .95 probability interval about the posterior mean.

27. For #26, if a further sample of 25 were taken and $\bar{x} = 100$, what would the final posterior for μ be?

28. Was the sample result in #27 surprising? What was the predictive probability of $\bar{x} \leq 100$?

29. A prior for $\Delta = \mu_1 - \mu_2$ has a mean of zero and is such that $P(-5 < \mu < +5)$ is roughly 2/3. If $\sigma^2 = 100$, what normal distribution would approximate the prior.

30. For #29, if we do normal sampling with $N = 10$ in each treatment group and $\bar{x}_1 = 52$ and $\bar{x}_2 = 45$, what is the posterior distribution of μ ?

31. What is the posterior probability that $\Delta \leq 0$? (For #30)

32. For a normal distribution, you estimate that $P(\sigma > 6) = .25$ and $P(\sigma > 4) = .50$. What prior gamma - 2 distribution for $1/\sigma^2$ would apply?

33. Continuing with #32, you estimate that $\mu = 100$ with $P(96 < \mu < 104) = .50$ if $\sigma = 16$. Using the normal distribution to represent your conditional distributions given σ^2 (or $1/\sigma^2$), what is the marginal prior for μ?

34. For #32 and 33, if $\bar{x} = 102$, $s^2 = 20$ and $N = 10$, describe the posterior distributions for μ and σ^2.

Answers
Problem Sheet on Bayesian Statistics

3. (b) 5/16, 1/5

(c) 41/80

4. (b) 15/40

(c) 31/40

5. 1/6,1/2, 1/6

6. 3/8

7. 25/41

8. 56/62

9. 90/1089

10. (a) reject H_o if $x \geq 6$

(b) $P(\pi = .25 \mid x = 6) = .099$
$P(\pi = .75 \mid x = 6) = .901$

12. (a)

X	P(x)
10	.001
9	.011
8	.045
7	.118
6	.204
5	.244
4	.204
3	.118
2	.045
1	.011
0	.001

(b) Yes (c) .400

13. 8.6 to 1

14.

truth

	H_o	H_1
H_o	0	3
H_1	6	0

Minimax rule: reject if $x \geq 2$

Bayes rule: reject if $r \geq 0$ i.e., do not sample

15. $C(.03 < \pi < .74) = .90$

16. Approximately:
$P(.13 < \pi < .58) = .90$

mean = .33
M.L.E. = .30

17. Assuming x = 7 observed

π	$P(\pi \mid x = 7)$
.50	.056
.60	.207
.70	.515
.80	.195
.90	.027

26. (a) $z = -2.5$
$C(92.86 < \mu < 99.14) = .95$

(b) mean of posterior = 94.96
variance = 1.94

$P(H_c) = P(z \leq 3.63)$

$P(92.24 < \mu < 97.68) = .95$

27. normal (95.48, 1/.615)

29. $m' = 0$, $v' = 25$

30. $m' = 3.89$
$v' = 11.11$

31. $P(\Delta \leq 0) = P(z \leq 1.17) = .121$

EVALUATION AND DIRECTOR'S COMMENTS

Fifty-one participants attended the presession. Most areas of the country were represented. States represented included California, Texas, Indiana, Minnesota, Virginia, Delaware, New York and New Mexico among others. Both large and small universities were also represented.

Classes were held daily from 9:00 A.M. to 4:30 P.M. with a coffee break in the morning and afternoon and an hour and a half break for lunch.

The facilities were not adequate as regards; blackboards, lighting and work space. The blackboards were old and difficult to see and write on. Tables should be provided so that students have a hard surface to write on in addition to work space.

A twenty-item pre-test on "classical" statistics was given on the first day and a nineteen-item post-test covering Bayesian principles was given on the last day. Scores on the pre-test ranged from 1 to 17 with a mean of 9 and a standard deviation of 3.6. This indicates the wide heterogeneity of background represented. Consequently, we decided to teach somewhat slower than originally planned. The post-test scores ranged from 3 to 15 with a mean of 8 and a standard deviation of 3.2. Nothing should be inferred from the fact that the post-test mean was lower than the pre-test mean since the the two tests were, for the most part, different. We were somewhat disappointed with the results of the post-test, but many of the items were difficult inasmuch as they covered concepts which would be interpreted differently in Bayesian theory as contrasted with classical theory. An item analysis of the post-test revealed that 68% of the students answered correctly on the item regarding the relation between classical and Bayesian theory. On three items regarding uses of Bayes theorem involving direct calculation and application to posterior distributions, the percentages answering correctly were 42%, 32% and 32%. This was somewhat heartening as we could assume that prior knowledge on this material was near zero.

An anonymous attitude survey was also administered on the final day. The responses were:

Do you anticipate doing more study of Bayesian statistics?

definitely yes	25
probably	9
probably not	
definitely no	

If you teach statistics or research methods, will you introduce some Bayesian concepts to your students?

definitely yes	17
probably	11

I do not teach statistics 7

Do you think that the addition of Bayesian statistics to your current statistical knowledge will aid you in your research work?

definitely yes	21
probably	12
probably not	1

Do you think you will apply Bayesian statistics or concepts in your research work?

definitely yes	13
probably	19

Do you think you have a better understanding of "classical" statistics as a result of the presession?

definitely yes	26
probably	6
probably not	2
definitely no	1

Two items asked "What did you like about the presession?" and "What did you not like about the presession?" Responses to the first item were quite gratifying. Ninety-five percent of the papers included responses such as "well-organized", "excellent teaching", "stimulating". About twenty percent had no criticism, but the other eighty percent made comments such as, "should have had more material on ditto", "more discussion", "too much to assimilate", and other comments relating to physical conditions as mentioned previously.

PRESESSION II

CURRICULUM RESEARCH AND EVALUATION

Director

Dr. Robert L. Baker
Arizona State University
Tempe, Arizona

INTRODUCTION

Curriculum Research and Evaluation was a five-day training course designed for school and university personnel holding doctoral degrees and having responsibility for the formulation and evaluation of curriculum programs. The purpose of the Presession was to provide formal training in the necessary methodological skills to formulate, initiate, conduct, evaluate and report experiments on school learning and instruction.

This Presession was one of six intensive training courses in educational research sponsored by the American Educational Research Association aided by a grant from the Bureau of Research, U.S. Office of Education. The Presession was held on February 11-13, 1967, in connection with the 1967 AERA Annual Meeting.

OBJECTIVES

The objectives of the Presession were designed to enable participants satisfactorily completing the program to:

1. Specify the desired outcomes of curricular programs in terms of observable learner behavior.
2. Describe in operational terms the planned classroom transactions for a given curricular program.
3. Specify appropriate independent and dependent variables for an experimental study, and state the specific relationships to be investigated in the study.
4. Select the most valid and practical experimental design for investigating the specified relationships.

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DESCRIPTIVE ANALYSIS OF PARTICIPANTS

Number of participants from each state

State and Institution Represented	Number (N=59)	Percent
California	2	3
Riverside Public Sch.		
Sonoma Public Sch.		
Connecticut	1	2
St. Educ. Dept.		
Florida	3	5
Miami-Dade J.C.		
U. of Florida - 2		
Georgia	1	2
U. of Georgia		
Illinois	5	8
CEMREL - 2		
N. Illinois U.		
Park Forest Public Sch.		
U. of Illinois		
Iowa	2	3
U. of Iowa - 2		
Kansas	1	2
Kansas St. Teachers Col.		
Maryland	2	3
Montgomery Co. Public Sch.		
U. of Maryland		
Massachusetts	2	3
Wellesley Public Sch.		
U. of Massachusetts		
Michigan	3	5
Lansing School Dist.		
U. of Michigan		
Wayne State U.		
Missouri	1	2
U. of Missouri		
Montana	1	2
Montana State U.		
Nebraska	1	2
U. of Nebraska		
Nevada	1	2
Clark Co. School Dist.		
North Carolina	1	2
Mecklinburg Public Sch.		
New Hampshire	2	3
U. of New Hampshire - 2		
New Jersey	3	5
Glassboro State Col.		
Rutgers		
Trenton St. Col.		

State and Institution Represented	Number	Percent
New York	11	19
Brooklyn College		
Cornell U.		
CUNY - 2		
Massapequa Public Sch.		
Mt. Vernon Public Sch.		
New York U.		
Queens College		
Syracuse U. - 2		
Ohio	4	7
Kent State U.		
Ohio U.		
Ohio State U.		
U. of Akron		
Oklahoma	2	3
Oklahoma State U. - 2		
Pennsylvania	3	5
Harrisburg Community Col.		
Pennsylvania State U.		
Temple U.		
Tennessee	1	2
Mid-Tennessee State U.		
Texas	1	2
North Texas State U.		
Virginia	3	5
Fairfax Co. Public Sch.		
Old Dominion College		
St. Educ. Dept.		
West Virginia	1	2
West Virginia U.		
Wisconsin	1	2
U. of Wisconsin		

Age Groupings

Age Bracket	Number (N=58)	Percent
55 and up	2	3
50-54	4	7
45-49	10	17
40-44	9	16
35-39	18	31
30-34	13	22
25-29	2	3
20-24	1	2

Number of male and female participants

Male		Total Number
43	70%	61

Female	
18	30%

Year of bachelor degree and major field

Year	Number (N=58)	Percent
1930-34	2	3
1935-39	5	9
1940-44	5	9
1945-49	11	19
1950-54	16	28
1955-59	15	26
1960-64	4	7
1965--	0	0

Major	Number	Percent
Elem. educ.	7	12
English (and speech)	7	12
Mathematics	7	12
History (and pol. sci.)	6	10
Social studies	6	11
Psychology	5	9
Chemistry	3	5
Industrial arts	3	5
Biology	2	3
Sec. educ.	2	3
Social psych.	2	3
Special educ.	2	3
Agriculture	1	2
Art	1	2
Curriculum	1	2
Home econ.	1	2
Languages	1	2
Sociology	1	2

Year of doctorate and major field

Year	Number (N=53)	Percent
1930-34	0	0
1935-39	1	2
1940-44	0	0
1945-49	1	2
1950-54	1	2
1955-59	9	17
1960-64	14	26
1965	11	21
1966	13	25
1967	3	6

Major	Number	Percent
Educ. psych.	10	19
Curriculum	6	11
Educ. admin.	6	11
Sec. educ.	6	11
Elem. educ.	5	9
Mathematics	4	8
Industrial arts	3	6
Counseling	2	4
Science	2	4
Social psych.	2	4
Agriculture	1	2
Art	1	2
Exceptional child	1	2
Home econ.	1	2
Political sci.	1	2
Special educ.	1	2
Technology	1	2

Courses taken

Type	(N=58)	Undergraduate		Graduate	
		No.	%	No.	%
Statistical Methods		18	31	54	93
Educational and Psychological Testing		24	41	41	71
Research Methods		10	17	51	88
Psychometric Methods		2	3	23	40
Calculus		18	31	3	5
Mathematical Statistics		12	21	8	14
Probability Theory		8	14	13	22

Position

Type	Number (N=58)	Percent
Education professor	10	17
Educational psychology professor	9	16
Evaluation and research	8	14
Student teacher instructor	2	3
Testing service	2	3
Counselor education	1	2
Research and planning head	1	2
Director - training school	1	2
Industrial arts professor	2	3
Mathematics education professor	2	3
Psychology professor	2	3
Agriculture education professor	1	2
Art education professor	1	2
College professor (unspecified)	1	2
Economics education professor	1	2
English education professor	1	2
Political science professor	1	2
Reading education professor	1	2
Curriculum supervisor	2	3
Science-math. department head	2	3
Coordinator of program implementation	1	2
Elementary school principal	1	2
Special education instructor	1	2

Percent of time teaching and in research work

	Teaching	(N=88)		Research	
Percent	Number	% of Participants	Percent	Number	% of Participants
90-100	6	7	90-100	5	6
80-89	3	3	80-89	0	0
70-79	9	10	70-79	6	7
60-69	6	7	60-69	6	7
50-59	19	22	50-59	18	20
40-49	2	2	40-49	3	3
30-39	7	8	30-39	9	10
20-29	3	3	20-29	11	12
10-19	0	0	10-19	4	5
0- 9	32	36	0- 9	19	22

Number of advisees

Undergraduates	(N=88)		Graduates		
	Number	Percent		Number	Percent
125 up	0	0	125 up	0	0
100-124	1	1	100-124	0	0
75- 99	1	1	75- 99	1	1
50- 74	3	3	50- 74	3	3
25- 49	12	14	25- 49	6	7
1- 24	6	7	1- 24	33	37
0	63	71	0	45	51

Primary research interests

Field	Number (N=70)	Percent
Curriculum	33	47
Measurement and evaluation	10	14
Learning theory	8	11
Programmed instruction and AV	5	7
Teacher education	4	6
Elementary education	2	3
Mental retardation and emotionally disturbed children	2	3
Teacher-student relations	2	3
Culturally deprived	1	1
Guidance	1	1
Personal writing	1	1
Reading	1	1

Number of journal articles

Number	No. of participants (N=58)	Percent
7 up	6	10
6	0	0
5	2	3
4	2	3
3	6	10
2	6	10
1	7	12
0	35	62

Number of funded research projects

Projects	No. of participants (N=58)	Percent
10	0	
9	0	
8	0	
7	0	
6	0	
5	0	
4	1	2
3	1	2
2	7	12
1	11	19
0	38	65

Number reading a paper at convention

	Present			Future	
	Number	Percent		Number	Percent
Yes	17	29	Yes	38	66
No	41	71	No	15	26
			Don't know	5	9

Rank order of professional activities

Type	First (N=58) Number	Percent	Type	Second (N=58) Number	Percent	Type	Third (N=53) Number	Percent
[illegible]	38	66	[illegible]	12	21	[illegible]	8	14
[illegible]	4	7	[illegible]	9	16	[illegible]	6	11
[illegible]	2	3	[illegible]	8	14	[illegible]	3	6
[illegible]	2	3	[illegible]	6	10	[illegible]	3	6
([illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible])	12	21	[illegible]	2	3	[illegible]	2	4
			[illegible]	2	3	[illegible]	2	4
			[illegible]	2	3	[illegible]	2	4
			[illegible]	2	3	[illegible]	2	[illegible]
			[illegible]	2	3	Miscl.	24	[illegible]
			(Miscl.)	11	19			

SCHEDULE OF ACTIVITIES

	8:30-10:00	10:15-11:45	1:30-3:00	3:15-4:45	7:00-8:30
Saturday February 11	(1) Pretest and Organization	(2) Types of Research Studies and Variables Objective #3	(3) Research Studies and Inferences Objectives 3 & 7	(4) Educational Outcomes Objective #1	(5) Informal Discussion
Sunday February 12	(6) Research Inferences Objective #7	(7) The Classroom and Experimental Error Objective #4	(8) Alternative Designs Objective #4	(9) Laboratory-Discussion	(10) Informal Discussion
Monday February 13	(11) Classroom Transactions Objective #2	(12) Criterion Measures Objective #5	(13) Alternative Designs Objective #4	(14) Laboratory-Discussion	(15) Informal Discussion
Tuesday February 14	(16) External Control Procedures Objective #8	(17) Criterion Measures Objective #5	(18) Components of the Research Proposal Objective #6	(19) Posttest	(20) Informal Discussion
Wednesday February 15	(21) Description of the Problem and Experimental Plans Objective #6	(22) Summary and Posttest Review			

DESCRIPTION OF PROCEEDINGS

Session 1 - Organization and Pretest

The first session began at 8:30 Saturday morning, February 11, with an introduc of the staff and an overview of the purposes of the Presession by Dr. Baker. Two handouts were given to the participants: (1) Schedule and Objectives (Appendix B), and (2) Program Overview (Appendix C). The participants were then given the Pretest (Appendix U) which took the remaining part of Session 1. The results are presented in the next major section of this report.

Session 2 - Types of Research Studies and Variables

Session 3 - Research Studies and Inference - Dr. Sullivan, instructor

The content of the first instructional sessions were to develop the following basic research concepts:

1. variable
2. criterion variable
3. variate
4. manipulable variable
5. non-manipulable variable
6. status study
7. associational study
8. experimental study
9. independent variable
10. dependent variable
11. statements of association
12. statements of causality

The content was presented in lecture form accompanied by a handout of exercises (Appendix D). At the conclusion of Session 3, the Summary Sheet (Appendix E) of the lecture content was distributed.

Session 4 - Educational Outcomes - Dr. Popham, instructor

The content of this session was to develop the necessity for the use of behavioral and operational language in the specification of goals.

A behavioral objective filmstrip (VIMCET) with taped commentary was viewed by the participants who responded to questions using an answer sheet (Appendix F).

Establishing minimal performance standards for individual and class levels was also discussed.

Sessions 5, 10, 11, and 20 - Informal Discussion

Participants were allowed to use these sessions for independent study or other activities.

Session 6 - Research Inferences - Dr. Sullivan, Instructor

The uses of the various types of studies were discussed in this session, as well as the types of statements that one can make about data based on the type of study used. One of the purposes of the Presession had to be re-emphasized as being concerned with what one can say and do to implement one's objectives rather than aiding in the making of value judgments of particular objectives.

Session 7 - The Classroom and Experimental Error - Dr. Baker, Instructor

The content of this session, which was concerned with Objective 4, was in the form of three self-contained packages:

1. Experimental Design in Educational Research (Appendix G) - which was an advance organizer for packages on experimental design.

2. Experimental Error - Internal and External Validity (Appendix H) - which dealt with the presence of variability in the results of studies. The content outline is as follows:

    I. Internal and External Validity

    II. Threats to Internal Validity
        A. History
        B. Maturation
        C. Testing
        D. Instrumentation
        E. Regression
        F. Selection
        G. Experimental Mortality
        H. Selection-maturation Interaction

    III. Threats to External Validity
        A. Testing and X-interaction
        B. Selection and X-interaction
        C. Reactive Arrangements
        D. Multiple X Interference

3. Methods for Reducing Error (Appendix I) - which had to do with randomization, control groups, and other ways to reduce experimental error. The content outline is as follows:

    I. Randomization

    II. Control Groups

III. Other Ways to Reduce Experimental Error
  A. Refinement of Techniques
  B. Blocking
  C. Adjustments in Statistical Analysis
  D. Number of Experimental Units
  E. Factorial Experimentation

The last two packages contained exercises with chemically pre-treated answer sheets.

Session 8 - Alternative Designs - Dr. Baker, Instructor

After a short discussion on questions raised in regards to the content of the previous session, another self-contained package with exercises and chemically pre-treated answer sheets was presented to the participants. This package, called Alternative Designs (Appendix J), had the following content outline:

I. Introduction

II. The Design's Critical Features as Illustrated by the Classical Experimental Design

III. Alternative Designs
  A. Repeated Observation Designs
    1. Time series design
    2. Varying treatment time series design
    3. Multiple time series design
    4. Equivalent time samples design
    5. Equivalent materials samples design
  B. Pretest-Posttest Designs
    6. Nonequivalent control group design
    7. Separate sample pretest-posttest design
    8. Separate sample pretest-posttest control group design
  C. (9) Institutional Cycle Design

IV. Selecting the Best Design

Session 9 - Laboratory-Discussion

This session was devoted to small discussion groups and individual study for working on packages. The group discussion topics were:

1. Evaluating Teacher Education Sequences
2. Validating Instructional Products
3. Evaluation in Schools using Flexible Models

Session 11 - Classroom Transactions - Drs. Popham and Sullivan, Instructors

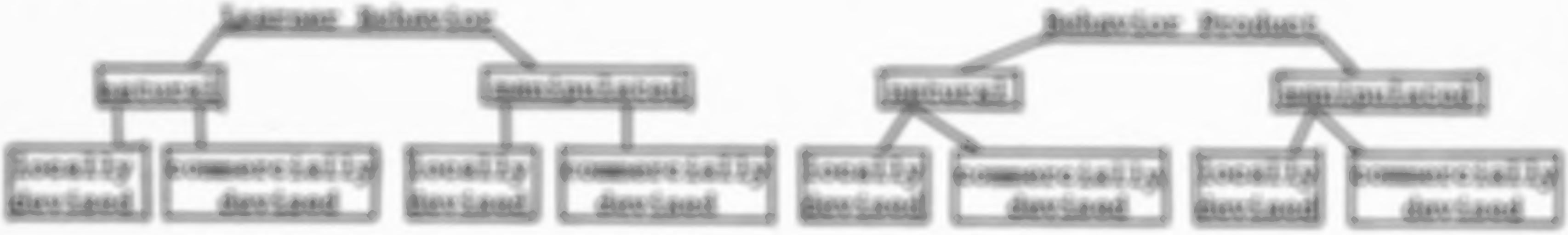
Dr. Popham attempted to describe in operational terms the planned classroom transactions through the use of a filmstrip, "Improved Educational Programs" and taped commentary. Participants responded to the audiovisual media by providing answers. (Appendix L is the answer sheet.) Four central ideas an educator must consider in proposed instructional improvements were stressed as follows:

1. Independent variable
2. Reproducibility
3. Justification
4. Evaluation

A great amount of time was spent in group discussion on objectives.

Session 12 - Criterion Measures - Dr. Popham, Instructor

A three rubric classification scheme for categorizing various types of educational criterion measures was described. This classification model was presented through transparencies on the overhead projector and a taped lecture. The model is as follows:


Learner Behavior
natural
manipulated
locally devised
commercially devised
locally devised
commercially devised
Behavior Product
natural
manipulated
locally devised
commercially devised
locally devised
commercially devised

The participants responded through the use of an answer sheet (Appendix M). Handouts included Criterion Measures Examples (Appendix N) and Metfessel and Michael's "A Paradigm Involving Multiple Criterion Measures for the Evaluation of the Effectiveness of School Programs" (Appendix O).

Session 13 - Alternative Designs - Dr. Baker, Instructor

This session was used as a review of the content of packages on experimental design. Dr. Baker cleared up misunderstandings, re-explained some material, and gave several examples on the chalkboard. The content mainly consisted of internal and external validity and design paradigms. Some questions on statistics were also considered.

Session 15 - Laboratory-Discussion

This session, like Session 9, was devoted to small discussion groups and individ study for working on packages. The topics were as follows:

1. Estimation vs. Hypothesis Testing (Baker)
2. Values and Weaknesses of Taxonomies (Sullivan)
3. Unobtrusive Measures (Popham)

Session 16 - External Control Procedures - Dr. Sullivan, Instructor

Dr. Sullivan described operationally appropriate "contingency management" procedures. His discussion stressed the following ideas: (1) often in a research project too little attention is given to the transactions which actually occur in the classroom; and (2) techniques which can be employed to monitor treatment delivery in the classroom to insure intended transactions are:

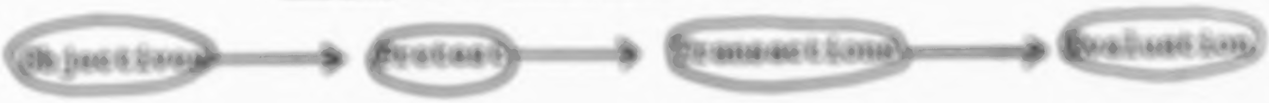
a. Pre-training of teachers in which they actually practice using the materials
b. Frequent review conferences
c. Record-keeping

Handouts were a description of Field Tryout Reports (Appendix F) and examples of Classroom Observation Record (Appendix G) and Lesson Record Sheet (Appendix H).

Session 17 - Criterion Measures - Dr. Popham, Instructor

Various kinds of evaluation procedures which are suitable for different purposes were described. Also, such phrases as formative evaluation, summative evaluation, norm referenced measures and criterion referenced measures were discussed. By presenting an empirical instruction paradigm, Dr. Popham showed how evaluation measures were dependent on prior aspects, especially behaviorally stated important objectives.

EMPIRICAL INSTRUCTION PARADIGM



Section 18 - Components of the Research Proposal - Dr. Baker, Instructor

Proposal formulation and planning were discussed in this session (which was shortened). The basic components of a sound research proposal were described: (a) differences in labels attached to components in varied proposal formats,

(b) differences in ways of sequencing and/or organizing component in overall proposal structure. Lastly, Dr. Baker explained the conditions that must be met for each basic component of a sound proposal. The above points were covered extensively in a handout, The Ingredients of the Research Proposal (Appendix E).

Session 19 - Posttest

It was announced several hours earlier that the posttest would be given during this session. Participants were given approximately an hour to study prior to this session. The posttest may be found in Appendix F. The posttest results are shown in an analysis in the next major section of this report.

Session 21 - Description of the Research Problem and Experimental Plans - Dr. Baker, Instructor

Dr. Baker discussed in more detail the components of the research proposal and answered additional questions concerning setting up one's experimental plans. An article by Schutz and Baker, "The Experimental Analysis of Behavior in Educational Research" (Appendix G) was distributed.

Session 22 - Summary

Dr. Baker unveiled the posttest results, comparing them with the pretest results. Participants received feedback on their specific pretest and posttest scores. Two institution evaluation devices were distributed and completed--the Participant Critique Form (Appendix H) and the Presession Rating Sheet (Appendix I). Results of these devices are included in the Evaluation section.

EVALUATION

This section includes the data of the participants' scores on the pretest and posttest, two non-intellective devices--Participant Critique Form and Presession Rating Sheet, and participant responses on some of the mastery tests. Lastly, the staff assistants' appraisal and recommendations are presented.

Pretest-Posttest Data

The pretest, administered in Session I, was composed of 75 questions designed to measure the level of achievement of the participants prior to the Presession so that gains in achievement could be measured. The posttest, administered in Session XX, also composed of 75 questions, was given to measure acquisition of the subject matter of the sessions. Table II presents the distribution of the pretest and posttest scores. Table III indicates the measures of central tendency, and Table IV presents the adjusted frequency distribution which includes only the scores of participants who took both the pretest and posttest.

An increase of participant demonstrated knowledge from pretest (mean=42) to posttest (mean=55) is demonstrated in graphic form, Table V.

An analysis by objective is given in Table VI for the pretest and posttest, by indicating the percent of right responses. For every objective there was an increased percent of right responses. It should be mentioned that the large increase for objective 8 could be due to the fact that on the pretest many did not have enough time to finish. Table VII gives a more detailed analysis of each item of the pretest and posttest indicating the percent of participants who responded correctly.

TABLE II

DISTRIBUTION OF PRETEST AND POSTTEST SCORES

Pretest		Posttest	
Total Right	No. of Persons (N = 56)	Total Right	No. of Persons (N = 56)
75		75	
.		.	
.		.	
64		64	1
63		63	3
62		62	4
61		61	3
60		60	2
59		59	3
58		58	6
57		57	5
56	1	56	3
55		55	1
54		54	6
53	1	53	
52	1	52	2
51	2	51	1
50		50	2
49	3	49	6
48	2	48	2
47	3	47	3
46	2	46	
45	4	45	
44	1	44	
43	4	43	
42	4	42	1
41	3	41	
40	3	40	1
39	5	39	
38	2	38	
37	1	37	
36	1	36	
35	3	35	
34	4	34	
33	1	33	
32		32	
31	1	31	
30	2	30	
29		29	
28		28	
27	2	27	
.		.	
.		.	
1		1	

TABLE III

MEASURES OF CENTRAL TENDENCY*

Pretest		Posttest	
Mean	= 41	Mean	= 55
Median	= 41	Median	= 57
Mode	= 38	Mode	= 57
Range	= 27-56	Range	= 40-64

TABLE IV

WORK TABLE FOR FREQUENCY DISTRIBUTION OF SCORES**

Score Intervals	Pretest Tally	Pretest Frequency	Posttest Tally	Posttest Frequency
61-64				11
57-60				10
53-56		5		8
49-52		6		8
45-48		10		5
41-44		11		1
37-40		10		1
33-36		6		
29-32		2		
25-28		1		
	Total	51	Total	51

---

* The first measures of central tendency for the pretest and posttest were determined from scores of all who took the pretest and all who took the posttest. These same measures were adjusted to include only those who took both the pretest and posttest.

**The frequency distribution work table, Table IV, and graph, Table V, includes the scores of those participants taking both the pretest and posttest.

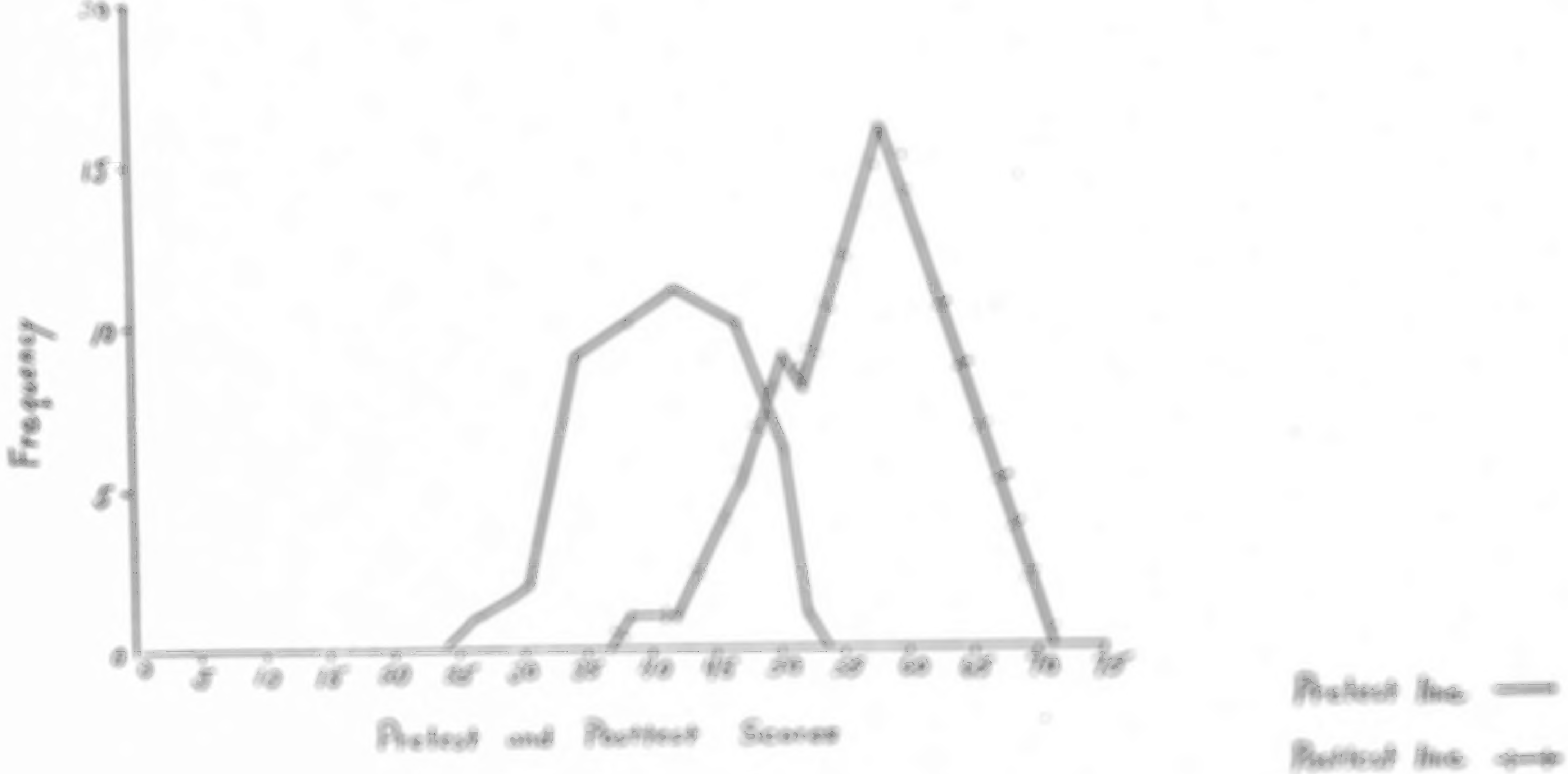


TABLE IV

FREQUENCY DISTRIBUTION OF PRETEST AND POSTTEST SCORES IN A FREQUENCY POLYGON

TABLE VI

ANALYSIS BY OBJECTIVE

	Pretest % right	Posttest % right
Objective #1 (Items 35-40, 66-69)	68	92
Objective #2 (Items 41-55, 66-69)	57	87
Objective #3 (Items 1-19)	62	85
Objective #4 (Items 20-38)	39	56
Objective #5 (Items 53-63)	56	77
Objective #6 (Items 70-73)	13	87

TABLE VII

ITEM ANALYSIS BY OBJECTIVE

Objective #1 Item No.	Percent Percentage Right
55	75
56	30
57	68
58	75
59	79
60	86
64-65	
Both right	64
One right	7

Objective #2 Item No.	
41	86
42	46
43	79
44	87
45	67
46	77
47	72
48	65
49	72
50	79
51	63
52	82
66-69	
All right	0
Three right	1
Two right	8
One right	34

Objective #3, 7 Item No.	Pretest Percentage Right
1	31
2	70
3	58
4	70
5	72
6	34
7	96
8	79
9	91
10	93
11	74
12	51
13	32
14	75
15	68
16	87
17	44
18	82
19	68

Objective #4 Item No.	
20	37
21	72
22	12
23	29
24	43
25	39
26	31
27	15
28	44
29	87
30	31
31	51
32	65
33	79
34	12

Objective #5 Item No.	Pretest Percentage Right
53	100
54	94
55	75
56	59
57	71
58	42
59	42
60	56
61	31
62	40
63	29

Objective #8 Item No.	
70-75	
All right	1
Five right	0
Four right	5
Three right	7
Two right	3
One right	16

TABLE VII

ITEM ANALYSIS BY OBJECTIVE

Objective #1 Item No.	Posttest Percentage Right
35	98
36	92
37	94
38	100
39	92
40	78
64-65	
Both right	80
One right	7

Objective #2 Item No.	
41	100
42	100
43	98
44	90
45	86
46	78
47	90
48	96
49	96
50	78
51	75
52	96
66-69	
All right	5
Three right	7
Two right	19
One right	51

Objective #3, 7 Item No.	Posttest Percentage Right
1	86
2	94
3	92
4	94
5	88
6	92
7	76
8	96
9	78
10	82
11	69
12	94
13	84
14	78
15	90
16	63
17	90
18	88
19	76

Objective #4 Item No.	
20	86
21	44
22	90
23	80
24	48
25	92
26	90
27	46
28	46
29	26
30	28
31	57
32	25
33	63
34	15

Objective #5 Item No.	Posttest Percentage Right
53	84
54	96
55	88
56	92
57	94
58	61
59	42
60	59
61	90
62	71
63	63

Objective #8 Item No.	
70-75	
All right	21
Five right	1
Four right	5
Three right	23
Two right	7
One right	7

Mastery Test Data

Three of the self-contained packages, (1) Experimental Error, (2) Methods for Reducing Error, and (3) Alternative Designs, had exercises using chemical feedback answer sheets. Tables VIII, IX, and X show a frequency distribution of participants' scores and measures of central tendency for the particular package, as well as the percent of correct responses for each item.

TABLE VIII

EXPERIMENTAL ERROR PACKAGE - MASTERY TEST DATA

Total Right	No. of Persons (N = 38)	Item No.	Percentage Right
40		1	
39		2	
38	4	3	97
37	2	4	92
36	1	5	79
35	2	6	89
34	3	7	89
33	8	8	95
32	3	9	89
31	5	10	95
30	2	11	82
29	2	12	87
28		13	74
27	1	14	71
26	3	15	84
25		16	87
24	1	17	87
23		18	84
22	1	19	84
21		20	79
.		21	53
.		22	79
2		23	
1		24	
		25	92
		26	79
		27	42
		28	82
		29	84
		30	13
		31	87
		32	68
		33	66
		34	82
		35	87
		36	74
		37	74
		38	63
		39	82
		40	58

Mean = 31
Median = 33
Mode = 33

TABLE IX

METHODS FOR REDUCING ERROR - MASTERY TEST DATA

Total Right	No. of Persons (N = 40)	Item No.	Percentage Right
14	1	1	90
13	1	2	93
12	7	3	83
11	5	4	83
10	8	5	65
9	6	6	73
8	4	7	75
7	6	8	83
6	1	9	18
5	1	10	63
4		11	40
3		12	70
2		13	60
1		14	48

Mean = 10
Median = 10
Mode = 10

TABLE X

ALTERNATIVE DESIGNS PACKAGE - MASTERY TEST DATA

Total Right	No. of Persons (N = 40)	Item No.	Percentage Right
25		1	83
24		2	70
23	2	3	88
22	3	4	93
21	9	5	63
20	8	6	53
19	5	7	
18	6	8	68
17	2	9	90
16	2	10	83
15	1	11	93
14	2	12	65
13		13	60
12		14	95
11		15	
10		16	68
9		17	85
8		18	93
7		19	80
6		20	
5		21	65
4		22	78
3		23	18
2		24	90
1		25	63

Mean = 19
Median = 20
Mode = 21

Participant Critique Form Analysis

The participants took full advantage of the opportunity offered to comment on the operation of the Presession. The Participant Critique Form is Appendix W. A summary of their responses, together with particularly germane comments, follows:

Question 1. To what extent did the relative unavailability of books and journals interfere with your attempts to master the content of this session?

Yes	2
Some	17
No	36

Although most people were undisturbed by the lack of books and felt that additional material was unnecessary, it was suggested that there be a limited display (such as Mager's, Campbell and Stanley's, etc.). Also several desired a before-presession reading list.

Question 2. To what extent did reproduced materials given to you by the staff improve matters?

Very Good	42
Good	9
Fair	3

Participants felt that the content of the handouts was superior, but that they needed more careful editing. In several cases they were too brief; they needed further expansion and more examples.

Question 3. Which features of the meeting rooms were inadequate or not conducive to learning?

Crowded	14
Lack of coffee	4
Poor ventilation; smoking	7
Outside noise	12
Poor first day conditions	12
Poor lighting	2

__Question 4__. Which features were especially facilitative in the same regard?

Tables	34
Good room location	6
Acoustics	5
Comfortable chairs	3
Seating arrangement	3

__Question 5__. Was five days too long a period to leave your work at home for the purpose of attending __this__ session?

Yes	17
No	37
Omit	2

__Question 6__. Was five days too short a period in which to learn much of the content of __this__ session?

Yes	19
No	37

Some participants would have liked more time, but could not take any more away from job. Also, some found New York a confounding variable in competing for their time.

__Question 7__. Were you allowed enough time in which to pursue activities of your own choosing?

Yes	42
No	8

Only a few indicated that too much time was allowed for activities of their own choosing, and that they would have liked evening sessions, and more beneficial group discussions.

__Question 8__. Would two organized meetings per day have been preferable?

Yes	9
No	37
Omit	7

__Question 9__. Would you have preferred more meetings per day than there actually were?

Yes	10
No	42
Omit	2

Some participants felt that more meetings were not necessary, but that better use concerning time and organization could have been made of scheduled

Question 10. Were the individual lectures too long to sit and listen or take notes?

Yes	
Sometimes	5
No	47
Omit	2

Question 11. Were the lectures schedules in an appropriate sequence?

Yes	42
Qualified yes	8
No	1
Omit	3

Some wanted a more precise overview of the sequence of the Presession.

It seemed to a few that the logical sequence was poorer toward the end.

Question 12. Did the content of the lectures and readings presuppose far more or far less previous training than you had?

Less	6
More	3
Depends on content	9
Level satisfactory	41

Some participants would have liked to have had a vocabulary list and pertinent reference list before the Presession. A few felt their previous training became more meaningful.

Question 13. To what extent was the content of the lectures and readings relevant to what you hoped to accomplish during the session?

Very relevant	30
Relevant	17
Less relevant	6
Not too relevant	1

Most of the comments indicated that the lectures and readings were above expectations, and that this Presession had helped to fill in gaps in past experience, therefore integrating a person's knowledge into a whole. Others were a little disappointed in these respects, saying that: lectures were not deep; more emphasis was needed on design and on models or programs to evaluate research outcomes.

Question 14. Did you receive sufficient advanced information on the purposes of the Presession?

Yes	43
Qualified yes	5
No	6

A few participants commented that the advanced information was received late and also that it needed more detail. There was a suggestion that a pretest also be send out with an answer key in order to help the university organization select who would benefit most by attending the Presession.

Question 15. Were you adequately oriented in the first session as to the structure and desired outcomes of the Presession?

Yes	2
Qualified yes	46
No	4
Omit	2

Some indicated the need for more structure in determining the overall picture.

Question 16. In general, was the Presession well organized?

Yes	50
Qualified yes	4
No	0

Suggestions about the organization and structure were:

1. Limited advanced reading list.
2. Handout for each session.
3. Deletion of commercialization of VIMCET.
4. Demonstration of other teaching methods and media.
5. Required work sessions and evening sessions.
6. Discussion of posttest.

To the participants, the most unsatisfactory aspect was the Laboratory-Discussion Periods each afternoon. They said that the sessions were too unstructured, too large, and non-cohesive. They need to be either greatly improved or eliminated. Leaders should have been assigned or elected as there were not enough staff to serve as chairmen.

Two suggested ways in which the time might have been used were: (a) working collectively on specific individual problem situations; (b) separating participants in terms of experience and then discussing the Presession content (an effort to allow for individual differences). One participant was impressed by the relaxed manner in which a rigorous schedule was maintained.

Question 17. Were the instructors (Baker, Popham, and Sullivan) too inaccessible or unapproachable so that you did not get the individual attention that you desired?

Yes	1
Qualified yes	3
No	48
Omit	2

The instructors were accessible to the group, but were in such constant demand that they were, at times, relatively inaccessible.

Question 18. Did you have sufficient opportunities to interact with other participants?

Yes	41
Qualified yes	5
No	6

Some participants felt "insecure" about meeting others. It was suggested that there could have been a luncheon or social hour for interested participants in order to encourage more interaction.

Question 19. Were you disappointed in any way with the group of participants?

Yes	12
Qualified yes	2
Qualified no	11
No	27

The two major criticisms of the group of participants were that: (a) several were over-participators who professed more knowledge than they possessed, and (b) some persons who were striving to meet their own emotional needs lost their objectivity by generalizing from previous personal experiences.

Other comments were that the group was too heterogeneous, some participants were apprehensive, some seemed hostile, and some were indifferent about working through the materials. One participant was most impressed with the tolerance of divergent points of view on the part of the staff without abdication of direction.

Question 20. If you had it to do over again, would you apply for this Presession which you have just completed?

Yes	51
No	0
Uncertain	3

One participant who answered yes indicated that he had paid all of his own expenses.

Question 21. If a Presession such as this is held again, would you recommend to others like you that they attend?

Yes	52
Qualified yes	1
No	0
Uncertain	1

Question 22. Do you anticipate maintaining some sort of contact with at least one member of the institute staff?

Yes	47
No	7

Question 23. Do you feel that your understanding of curriculum research design and development has been considerably enriched in these five days?

Yes	48
Qualified yes	1
No	5

Question 24. Do you feel that AERA is making an important contribution to education by sponsoring Presessions such as this one?

Yes	54
No	0

Question 25. Do you feel that anything has happened during these five days to make it more likely that you will leave your present position of employment?

Yes	7
Maybe	4
No	43

Question 26. Would you say that because of this Presession you are more able to state a given educational problem in operational form so that it is, if it can be, amenable to experimentation?

Yes	52
Qualified yes	1
Omit	1

Question 27. Do you feel that the staff should feel that it has accomplished its objectives during this five day Presession?

Yes	53
Qualified yes	1
No	0

Other Comments

Location of Presession:

warmer place
less expensive place

Objectives:

Too concerned with mechanics of curriculum research, than value-oriented decisions which have to be made.
Supplemental session on conslusions that can be drawn from status, coreelational, and experimental studies.
Curriculum development needs more time.
There should be a package on sequencing steps in treatment or material development.
Presentations were a little weak on philosophical rationale.
Need to differentiate research strategy and statistical models.

Packages:

Needed more time to work on packages.
Should have been edited more carefully.

Lectures:

Informality was good; however, lectures seemed fragmentary at times.

Miscellaneous:

Humor was enjoyed.
Follow-up session was needed on proposal writing and on statistical methods.

Presession Rating Sheet Analysis

Each participant completed a presession rating sheet (Appendix X). They rated each of the following on a set of scales beneath each concept. A high number at one end of the scale indicates the concept was judged to be very closely related to that end. A concept which was moderately related would have a high number *near* the end, and a neutral concept would have a high number in the middle space.

1. Participants
2. Robert Baker
3. Howard Sullivan
4. James Popham
5. Assistants
6. Cooperation among Instructors
7. Written Packages
8. Taped-visual Program
9. Oral Presentation
10. Pretest-Posttest Procedures
11. Behavioral Objectives
12. Research Studies
13. Criterion Measures
14. Experimental Design

Participants

1. good	21	22	11	0	0	bad
2. unfriendly	0	2	3	22	27	friendly
3. stimulating	8	35	9	1	1	dull
4. positive	13	30	9	1	1	negative
5. unhelpful	1	3	11	29	10	helpful
6. right	3	18	30	0	0	wrong
7. incapable	0	2	8	21	24	capable
8. unavailable	0	1	13	28	13	available
9. interesting	17	27	6	5	0	uninteresting
10. unsuccessful	0	2	10	30	11	successful
11. prepared	14	23	12	5	0	unprepared
12. acceptant	14	30	10	0	0	rejecting

Robert Baker

1. good	39	12	4	0	0	bad
2. unfriendly	0	1	3	16	34	friendly
3. stimulating	38	12	0	2	0	dull
4. positive	37	13	3	1	0	negative
5. unhelpful	0	0	1	22	30	helpful
6. right	18	23	12	0	0	wrong
7. incapable	0	0	1	5	45	capable
8. unavailable	0	3	4	24	23	available
9. interesting	38	13	1	0	0	uninteresting
10. unsuccessful	0	0	2	16	35	successful
11. prepared	44	9	0	0	1	unprepared
12. acceptant	23	24	5	1	0	rejecting

Howard Sullivan

1. good	20	21	8	3	0	bad
2. unfriendly	1	3	2	16	33	friendly
3. stimulating	7	23	16	6	2	dull
4. positive	22	23	7	2	1	negative
5. unhelpful	1	2	10	15	26	helpful
6. right	18	18	13	3	0	wrong
7. incapable	0	1	4	19	29	capable
8. unavailable	1	1	8	17	27	available
9. interesting	8	23	11	7	3	uninteresting
10. unsuccessful	2	6	5	22	19	successful
11. prepared	31	16	4	2	1	unprepared
12. acceptant	31	17	5	0	1	rejecting

James Popham

1. good	30	18	5	0	0	bad
2. unfriendly	1	0	3	17	33	friendly
3. stimulating	41	12	0	0	0	dull
4. positive	38	8	6	1	0	negative
5. unhelpful	0	0	3	13	36	helpful
6. right	17	20	12	1	0	wrong
7. incapable	1	0	2	11	39	capable
8. unavailable	2	0	6	15	24	available
9. interesting	40	10	0	1	3	uninteresting
10. unsuccessful	1	1	1	15	35	successful
11. prepared	46	5	2	0	0	unprepared
12. acceptant	22	23	7	0	1	rejecting

Assistants

1. good	34	13	8	0	0	bad
2. unfriendly	0	0	5	13	36	friendly
3. stimulating	4	9	37	0	0	dull
4. positive	18	15	15	1	0	negative
5. unhelpful	0	0	3	11	38	helpful
6. right	9	8	34	1	0	wrong
7. incapable	0	0	5	10	40	capable
8. unavailable	1	0	4	13	36	available
9. interesting	10	10	31	1	0	uninteresting
10. unsuccessful	0	0	11	12	32	successful
11. prepared	46	6	3	2	1	unprepared
12. acceptant	28	7	18	0	0	rejecting

Cooperation among Instructors

1. good	44	5	5	0	0	bad
2. unfriendly	0	0	3	10	33	friendly
3. stimulating	40	8	5	0	0	dull
4. positive	35	13	3	1	1	negative
5. unhelpful	0	0	3	15	34	helpful
6. right	19	15	16	0	0	wrong
7. incapable	0	0	12	11	29	capable
8. unavailable	2	1	12	13	25	available
9. interesting	32	11	8	0	0	uninteresting
10. unsuccessful	0	1	6	9	36	successful
11. prepared	31	11	7	2	1	unprepared
12. acceptant	27	10	12	2	0	rejecting

Written Packages

1. good 34 : 19 : 1 : 0 : 0 bad
2. useless 0 : 0 : 1 : 13 : 40 valuable
3. stimulating 25 : 23 : 3 : 3 : 0 dull
4. positive 28 : 20 : 5 : 0 : 0 negative
5. unorganized 0 : 1 : 3 : 13 : 29 organized
6. impractical 0 : 0 : 4 : 13 : 36 practical
7. passive 0 : 2 : 14 : 20 : 16 active
8. important 36 : 15 : 1 : 0 : 1 unimportant
9. satisfying 24 : 27 : 1 : 2 : 0 disappointing
10. unsuccessful 0 : 2 : 0 : 22 : 30 successful

Taped Visual Program

1. good 28 : 19 : 5 : 0 : 1 bad
2. useless 0 : 0 : 3 : 16 : 34 valuable
3. stimulating 19 : 23 : 8 : 3 : 0 dull
4. positive 22 : 21 : 9 : 1 : 0 negative
5. unorganized 0 : 0 : 2 : 14 : 37 organized
6. impractical 0 : 0 : 4 : 16 : 34 practical
7. passive 0 : 5 : 10 : 20 : 17 active
8. important 30 : 18 : 4 : 2 : 1 unimportant
9. satisfying 19 : 27 : 6 : 1 : 0 disappointing
10. unsuccessful 0 : 1 : 3 : 25 : 24 successful

Oral Presentation

1. good 18 : 27 : 5 : 3 : 0 bad
2. useless 0 : 1 : 2 : 29 : 18 valuable
3. stimulating 21 : 27 : 4 : 2 : 0 dull
4. positive 26 : 22 : 5 : 0 : 0 negative
5. unorganized 0 : 4 : 1 : 21 : 27 organized
6. impractical 0 : 2 : 4 : 22 : 24 practical
7. passive 1 : 3 : 5 : 22 : 20 active
8. important 27 : 20 : 3 : 2 : 1 unimportant
9. satisfying 22 : 25 : 5 : 3 : 0 disappointing
10. unsuccessful 0 : 2 : 6 : 20 : 24 successful

Pretest-Posttest Procedures

1. good 22 : 21 : 5 : 2 : 1 bad
2. useless 1 : 2 : 3 : 22 : 23 valuable
3. stimulating 20 : 20 : 7 : 2 : 2 dull
4. positive 20 : 28 : 5 : 1 : 0 negative
5. unorganized 0 : 1 : 1 : 14 : 35 organized
6. impractical 0 : 3 : 4 : 15 : 30 practical
7. passive 2 : 1 : 10 : 14 : 23 active
8. important 27 : 17 : 5 : 1 : 0 unimportant
9. satisfying 20 : 19 : 11 : 0 : 2 disappointing
10. unsuccessful 0 : 3 : 6 : 14 : 23 successful

Behavioral Objectives

1.	good	31	20	1	0	0	bad
2.	useless	0	1	0	9	44	valuable
3.	stimulating	27	18	6	0	1	dull
4.	positive	29	18	4	1	0	negative
5.	unorganized	0	0	0	13	39	organized
6.	impractical	0	0	2	13	37	practical
7.	passive	2	2	8	16	23	active
8.	important	36	13	2	0	1	unimportant
9.	satisfying	23	20	7	3	0	disappointing
10.	unsuccessful	0	0	6	20	28	successful

Research Studies

1.	good	23	24	3	1	0	bad
2.	useless	0	2	0	18	31	valuable
3.	stimulating	19	21	8	2	1	dull
4.	positive	22	19	8	2	0	negative
5.	unorganized	0	1	3	15	32	organized
6.	impractical	0	2	2	20	27	practical
7.	passive	1	2	10	17	21	active
8.	important	39	10	1	2	0	unimportant
9.	satisfying	16	24	8	4	0	disappointing
10.	unsuccessful	0	4	4	27	17	successful

Criterion Measures

1. good 24 : 24 : 2 : 0 : 1 bad
2. useless 0 : 1 : 2 : 7 : 36 valuable
3. stimulating 16 : 27 : 4 : 2 : 1 dull
4. positive 20 : 26 : 4 : 1 : 0 negative
5. unorganized 0 : 1 : 1 : 19 : 30 organized
6. impractical 0 : 1 : 2 : 19 : 30 practical
7. passive 1 : 1 : 11 : 18 : 16 active
8. important 37 : 12 : 0 : 1 : 1 unimportant
9. satisfying 17 : 28 : 2 : 3 : 2 disappointing
10. unsuccessful 0 : 1 : 3 : 23 : 24 successful

Experimental Design

1. good 35 : 11 : 5 : 1 : 1 bad
2. useless 0 : 1 : 1 : 5 : 42 valuable
3. stimulating 23 : 19 : 6 : 3 : 1 dull
4. positive 23 : 20 : 7 : 1 : 1 negative
5. unorganized 0 : 1 : 5 : 15 : 31 organized
6. impractical 0 : 1 : 4 : 13 : 34 practical
7. passive 1 : 1 : 14 : 16 : 18 active
8. important 41 : 8 : 1 : 0 : 1 unimportant
9. satisfying 18 : 19 : 9 : 4 : 0 disappointing
10. unsuccessful 0 : 4 : 8 : 23 : 17 successful

PRESESSION III

DESIGN AND ANALYSIS
OF
COMPARATIVE EXPERIMENTS IN EDUCATION

Director

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INTRODUCTION

Prior to the 1967 Annual Meeting of the American Educational Research Association in mid-February 1967, a group of nearly 70 educational researchers gathered together with a staff of six instructors and assistants to pursue the study of the design and analysis of comparative educational experiments. Part of the costs of the operation of this Presession was met by a grant to AERA from the U.S. Office of Education. (The larger portion of the costs, viz., the personal expenses incurred by the participants was borne by the participants themselves.) The 1967 Presession on Design of Comparative Experiments was one of a program of six AERA Research Training Presessions for 1967.

The evaluation of the 1967 Design of Experiments Presession was made easier because techniques, instruments, and an evaluation strategy had been devised by the Center for Instructional Research and Curriculum Evaluation of the University of Illinois in their evaluation of a AERA 1966 Presession. The "Report of the Evaluation of the AERA 1966 Presession on the Design of Educational Experiments" by Robert E. Stake, Gene V. Glass, and Peter A. Taylor is available to persons with special interests in research training from CIRCE, 270 Education Building, University of Illinois, Urbana. Because no funds were available for evaluation of the 1967 Design of Experiments Presession, this evaluation report hardly compares favorably with its immediate predecessor.

OBJECTIVES

The principal statements of objectives were the following:

"The proposed 5-day presession is intended to improve the research skills of the participants in designing, conducting, and analyzing controlled variable-manipulating experiments in an educational context. Upon completion of the presession the participants should be able to select the most appropriate design for a given problem, collect data in accordance with the design, and correctly analyze and interpret the results of the experiments."

"The participants should acquire or reacquire approximately thirty verbal concepts relevant to designing experiments and prerequisite too much of the latter discussion by Stanley and others at the presession. Examples are 'comparative study', 'experiment', 'randomness', 'factorial design', and 'covariable'."

"The participants should relate the sources of internal and external validity discussed in the Campbell-Stanley chapter to designing educational experiments, and to help them understand that in the chapter little consideration is given to statistical analysis, the power of significance tests, point estimation, and interval estimation."

"The participants should recognize and define *crossed* and *nested* factors; *fixed*, *random*, and *finite* factors; and should determine sources of variation, degrees of freedom, sums of squares, and expected values of mean squares for most balanced (equal n's) analysis of variance designs."

"The participants should determine appropriate combinations of mean squares to obtain unbiased estimates of variance components in the random effects analysis of variance model; and should make an appropriate choice of or 'construct' an appropriate 'error term' for almost any analysis of variance design."

"The participants should be able to read tables reporting the effects of violation of ANOVA assumptions on the power and level of significance of the F-test; and should be able to establish confidence intervals around contrasts in a set of group means by the methods of Scheffe' and Tukey."

Classes of objectives for Presession on the Design of Comparative Experiments

Upon completion of the Presession participants should be able to:

1. Interpret the threats to internal and external validity related to a given experiment.
2. Identify the experimental unit involved in any experiment and compare it to the unit of statistical analysis.
3. Describe the operations involved in each of the experimental and quasi-experimental designs described by the Campbell and Stanley chapter.
4. Explain how randomization and blocking function to minimize bias and how blocking further results in increased precision.
5. Distinguish between main and nested classifications and between fixed, random, finite, and mixed models.
6. State the assumptions underlying a given analysis and describe the effects of failure to meet a given assumption (heterogeneous variances, non-normality, repeated measures designs).
7. Write the linear model and determine expected mean squares and degrees of freedom for a given experiment. Compute sums of squares, mean squares, and appropriate F ratios.
8. Graph and interpret various degrees of interaction.
9. Distinguish between planned and ex-post-facto comparisons between levels of a classification. Compute orthogonal contrasts, Scheffe and Tukey tests.
10. Identify appropriate analytic technique for unbalanced designs.
11. Perform and interpret analyses of covariance.

Surely no finite listing can capture much of what is sought and attained in any instructional program. The above objectives are merely class names within which there were multitudes of goals for participants' knowledge and behavior. Our actual specific objectives - many of which were not even known to us - could only be known through an exhaustive study of the instructional materials, video tapes of lectures, etc.

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SELECTION OF PARTICIPANTS

Applications were received through the mail and screened by the Presession Director. A total of 144 applications were received for 75 openings. Criteria used for selecting participants were as follows:

1. Doctorate. It has been decided that applicants not holding the doctorate continued to have opportunity to develop skills in the design of experiments through regular doctoral programs. Two doctoral students were admitted, however, for special reasons.

2. Age. Age was given some small consideration in selection in accordance with its importance as indicated by correlational data in the Evaluation Report of the 1966 AERA Design of Educational Experiments Presession (which see).

3. Formal training in statistics. Because of the level of the instruction in the Presession, it was necessary to assume that every participant had training in statistics equivalent to one course. Accordingly, applicants who reported no formal course work in statistics were eliminated. (NOTE: 45 of the 144 applicants were eliminated on criteria 1-3).

4. Estimate of potential contribution to educational research. Data on institutional affiliation, percent of time in research, publication history, and past research activity were combined judgmentally by the selection committee into a single estimate of "potential contribution to educational research". After criteria 1-3 above, this criterion was used exclusively in selection.

A group of 15 "stand-bys", who narrowly missed selection, was designated. These persons were to be given the opportunity to attend the Presession in the event that some of the 75 selected participants could not attend. Nine of the 75 participants notified the director some time after December 21, 1966, that they could not attend. In most cases this notice was received too late for the notification of "Stand-bys". However, two "Stand-bys" were invited to attend two days before the Presession began, and they graciously accepted.

It should be noted that AERA membership was not a requirement for participation in the Presession; it was not even observed by the selection committee. Of 65 participants, 13 were not members of AERA.

The following notice was mailed to the 75 persons selected as participants from the 144 applicants:

1967 AERA Presession on the Design
and Analysis of Comparative Experiments

TO: Applicants Selected to Participate in the Design and Analysis Presession

FROM: Gene V. Glass, Kenneth D. Hopkins, Jason Millman

DATE: December 21, 1966

It is our pleasure to inform you that you are one of the 75 persons whom we have chosen from among 140 applicants to invite to participate in the 1967 AERA Design and Analysis Presession. A roster of the participants is enclosed in this letter. It is our hope that you and the 74 other chosen applicants will accept our invitation and join us at Grossingers Resort Hotel from February 11, 1967 through February 15, 1967.

If for any reason you find it impossible to attend the Presession for the full
five days, please telephone or write me immediately to withdraw so that one of the
several excellent alternates we had to turn down can be given your position.

Participants should check into Grossingers Resort Hotel (located in Grossinger,
New York, in the Catskill Mountains approximately 80 miles north of New York City)
in the afternoon or evening of Friday, February 10, 1967. The Short Line Bus leaves
the Port of Authority Building (40th Street and Eighth Avenue) for Grossingers at
regular intervals. The round trip fare is $9.90. It will not be necessary for you
to make your own reservations at Grossingers; you need only check in on February 10,
1967. All participants will be placed in double rooms so that the total expense
for room, meals, and tips can be held to only $108 for the full five days. If two
of you wish to "double-up" with another participant, notify us by January 8, 1967,
the date when we submit the reservation list to Grossingers. Those who do not
express a preference for a roommate will be randomly paired--within sexes.

In the weeks prior to February 11, 1967, we hope that you will prepare yourself
to benefit maximally from the Presession. If time permits, it would be advisable to
review the principals of the one-factor analysis of variance, appropriate portions
in Hays' Statistics for Psychologist (Chapter 12 and 13), Lindquist's Design and
Analysis of Experiments in Education and Psychology (Chapters 2 and 3), and Winer's
Statistical Principles in Experimental Design (Chapters 2 and 3), are excellent for
this purpose. Ferguson's second edition (1966) of Statistical Analysis in Psychology
and Education and Walker and Lev's Statistical Inference (1953) are also excellent
review materials. A knowledge of approximately the first one-third of D.T. Campbell
and J.C. Stanley's "Experimental and Quasi-experimental Designs for Research on
Teaching", Chapter 5 in N.L. Gage's (Editor) Handbook of Research on Teaching will
be basic. Casual reading in such sources as D.R. Cox's Planning of Experiments,
R.A. Fisher's Design of Experiments, or W.C. Guenther's Analysis of Variance would
enhance your preparation but is not, of course, requisite to participating.

We shall rely entirely on specially prepared mimeographed instructional materials. The materials which you will be given at the Presession should be reasonabl self-sufficient, though undoubtedly you will wish to bring along a few reference works from your personal library. The instructional staff will make available a large number of reprints and unpublished papers from their own holdings.

You may expect a final mailing in early February 1967 containing last minute information. If you have specific question which must be answered immediately, do not hesitate to write us at 270 Education Building, University of Illinois, Urbana, Illinois 61801.

Thank you for your expression of interest in our Presession. We look forward to working with you.

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(social interact.; curric. develop. and eval.)

DESCRIPTION OF THE PARTICIPANTS

Sixty-eight participants attended the Presession and took part in the bulk of he evaluation. In this section, 65 of the participants will be described in terms f biographical variables; the data were gathered prior to the Presession on the pplication Form (see Appendix). The participants will be described and compared ith participants in the 1966 Design Presession by reference to 9 variables:

1. Sex: Number of males--56, number of females--9.
   (1966: Males - 44, Females - 6).

2. Age: Mean age--37.19 years
   Standard deviation(s)--6.62 years
   (1966: M=37.2; s=6.4).

3. Year in Which Doctorate was Awarded:
   M--1961.44, s--4.35
   (1966: M=1952.80, s=21.88).

4. Research Productivity:
   No. of publications in scholarly (referred) journals for which participant is sole or joint author. M=3.46; s=3.63
   (1966: M=2.18; s=3.26).

5. Formal Training (Course Work) in Applied Statistics:
   64 of 65 participants reported having taken course work in "statistical techniques". (1966: 49/50).

6. Formal Training in Mathematics:

   a. Proportion reporting course work in math statistics--11/65
      (1966: 9/50).

   b. Proportion reporting course work in calculus--23/65
      (1966: 19/50).

7. Formal Training in Testing and Measurement:

   a. Proportion reporting course work in educational and psychological testing--63/65; (1966: 41/50).

   b. Proportion reporting course work in psychometrics--41/65;
      (1966: 24/50).

8. Nature of Employment (Research vs. Teaching):
   Percent of time allotted to research. M=38.0, s=27.0. (1966: M=39.9, s=31.4).

9. Funded Research Activity:
   Average number of completed, funded research projects for which participant was first or joint author--M=1.20, s=1.09
   (1966: M=0.47, s=1.07).

Table 1

Geographic Distribution of Participants

The participants came from 23 States, the District of Columbia, and Ontario, Canada. The States and number of participants each contributed (if more than one) are as follows:

1. Ariz. - 3
2. Cal. - 3
3. Colo. - 2
4. Conn. - 3
5. Fla.
6. Ga. - 4
7. Hawaii
8. Ill.
9. Ind. - 4
10. Md. - 4
11. Mass.
12. Mich. - 5
13. Minn.
14. N.D.
15. N.J. - 2
16. N.Y. - 13
17. N.C. - 2
18. Ohio - 5
19. Or.
20. Pa. - 5
21. Tex. - 2
22. Wash.
23. Wis.
24. On.,Ca. - 2
25. Wash.,D.C.

SCHEDULE OF ACTIVITIES

Participants arrived at Grossingers Resort Hotel during the day (Friday) preceding the commencement of the Presession. Arrangements for travel and funding of their stay were left to each participant.

The intended schedule of activities appears as Table 2. This is the schedule drawn up by the Director prior to the Presession. The following modifications of the intended schedule occurred: 1) starting times for morning, afternoon, and evening meetings were changed to 9:30 A.M., 2:15 P.M., and 8:30 P.M. to conform to the schedule of meals at the hotel; 2) on the basis of questionnaire results (to be described under "Formative Evaluation" below) the Tuesday evening lectures were switched to Tuesday morning and replaced with small-group discussions on topics of special interest to the participants; 3) the Wednesday afternoon cocktail party was switched to Tuesday before the evening meeting as the participants expressed a desire to adjourn earlier on Wednesday. (A bus was chartered to take the participants to the AERA Annual Meeting site - New York City - on Wednesday afternoon.)

Table 2

Table 2

Intended Schedule of Activities

	Persons Inv.			Materials	
	Instructors	Assistants	Participants	Instructional Materials	Evaluation Materials
Friday, February 10, 1967.					
8:30 p.m.					
Planning meeting for Instructors and Assistants	X	X			
Saturday, February 11, 1967.					
9:00 a.m.					
Saluation and introduction of staff.	X		X		
9:10 a.m.					
Administration of cognitive structure instrument		X	X		E-1*
9:30 a.m.					
a. Lecture--Principles of Design and Analysis (Glass-Millman).	X		X	IM-1 IM-2 IM-3 IM-6	
b. Evaluation of Lecture		X			E-8
1:30					
a. Lecture--Principles of Experimental Design and One-factor ANOVA; Experimental unit vs. unit of analysis. (Glass)	X		X	IM-1 IM-2 IM-3 IM-6	
b. Evaluation of Lecture		X			E-8
6:30 p.m.					
Cocktail party and social hour.					
7:30 p.m.					
a. Individual participants work on problem sets.	X	X	X	PS-1 PS-2	

*These notations are codes with which mimeographed instructional materials, problem sets, and evaluation materials were identified.

	Instructors	Assistants	Participants	Instructional Materials	Evaluation Materials
30 p.m.					
b. Administration of mastery tests		X	X		E-4
unday, February 12, 1967.					
:00 a.m.					
a. Score and summarize responses to mastery tests.		X			E-4
b. Participants prepare (in writing) questions over content to be submitted to staff			X		
:30 p.m.					
a. Lecture--Rules of Thumb for Performing ANOVAs. (Millman)	X		X	IM-5	
b. Evaluation of Lecture		X		PS-2	E-8
7:00 p.m.					
a. Lecture--Continuation of "Rules of Thumb..." (Millman)	X		X	IM- IM-	
b. Evaluation of Lecture		X			E-8
8:45 p.m. Response by instructors to questions submitted in a.m. by participants	X		X		
9:00 p.m. Distribution of formative evaluation instrument		X			E-2
Monday, February 13, 1967.					
9:00 a.m.					
a. Collection of formative evaluation		X			E-2

	Instructors	Assistants	Participants	Instructional Materials	Evaluation Materials
b. Individual participants work on problem sets	X	X	X	PS PS	
c. Administration of mastery tests		X	X		E-5
d. Tabulation of responses to formative evaluation instrument		X			E-2
1:30 p.m.					
Discussion of formative evaluation results	X		X		E-2
1:40 p.m.					
a. Lecture--Analysis of Covariance Designs (Hopkins) X	X	X	X	IM-8	
b. Evaluation of Lecture		X			E-8
c. Scoring of mastery tests		X			E-5
7:00 p.m.					
a. Lecture--Consequences of Failure to Meet ANOVA Assumptions (Glass)	X		X	IM-7	
b. Evaluation of Lecture		X			E-8
Tuesday, February 14, 1967.					
9:00 a.m.					
a. Participants work on problem sets	X	X	X	PS-5 PS-6	
b. Participants prepare, in writing, questions for the staff			X		
c. Administration of mastery tests		X	X		E-6 E-10
1:30 p.m.					
a. Lecture--Planned and Multiple Comparisons (Hopkins)	X		X	IM-4	
b. Evaluation of Lecture		X			E-8
c. Scoring of mastery tests		X			E-6 E-10

	Instructors	Assistants	Participants	Instructional Materials	Evaluation Materials
7:00 p.m.					
a. Lecture--Analysis of Covariance and Repeated Measures Designs (Hopkins and Glass)	X		X	IM IM	
b. Response to questions from participants	X				
c. Evaluation of Lecture		X			E-8
Wednesday, February 15, 1967.					
9:00 a.m.					
a. Individual participants work on problem sets	X	X	X	IM-7 IM-8	
b. Mastery tests					E-7 E-9
1:30 p.m.					
a. Administration of cognitive structure instrument		X	X		E-1
b. Administration of participant critique form.		X	X		E-3
2:30 p.m.					
Cocktail party and adjournment	X	X	X		

MATERIALS UTILIZED DURING THE PRESESSION

a selection of material supplementary to

MATERIALS UTILIZED DURING THE PRESESSION

Each staff member brought with him, a selection of material supplementary to his lectures. These handouts provided either background reading to the lecture, or a more detailed, formalized presentation of the content (or, of course, both). Generally, the background reading was not provided in sufficient time for the participants to have an opportunity to look through it before the lecture.

A list of the material received by each participant follows:

Instructional Materials and Evaluation
Instruments Used in 1967 Presession on Design of Experiments

I. Instructional Materials

A. "Notes on Sources of Internal and External Experimental Invalidity", by Gene Glass. pp. 3.

B. "Illustrations of Sources of Internal Invalidity", by Gene Glass. pp. 2.

C. "Elementary Experimental Design--An Expository Treatment", by Julian Stanley. pp. 23.

D. "The Experimental Unit and the Unit of Statistical Analysis: Comparative Experiments with Intact Groups", by Gene Glass. pp. 8.

E. "ANOVA Interactions in Factorial Designs", by Jason Millman. pp. 7.

F. PROBLEM SET to accompany ANOVA Interactions in Factorial Designs, by Jason Millman. pp. 3.

G. "Analysis of Variance in One-Factor Experiment", by Gene Glass. pp. 19.

H. "Exercises in Determining Power of the F-Test", by Richard Schutz. pp. 1.

I. "Rules of Thumb for Writing the ANOVA Table", by Jason Millman and Gene V. Glass. pp. 18.

J. PROBLEM SET to accompany "Rules of Thumb....", by Jason Millman. pp. 20.

K. "Unweighted Means Analysis--Disproportional Subclass Numbers. Example Problems", by Kenneth Hopkins. pp. 1.

L. "Unequal and Disproportional Cell Frequencies -- Problem Sets", by Kenneth Hopkins. pp. 3.

M. "Consequences of Failure to Meet the Assumptions Underlying the Analysis of Variance". Gene V. Glass. pp. 37.

N. "Exercises on Consequences of Failure to Meet ANOVA Assumptions", by Gene Glass. pp. 2.

O. "Multiple Comparisons Procedures", by Gene Glass. pp. 24.

P. Multiple Comparisons -- Problem Sets and Notes, by Kenneth Hopkins. pp. 16.

Q. "A Scheme for Proper Utilization of Multiple Comparisons in Research: A Case Study Illustrating Need by Kenneth Hopkins and Russell A. Chadbourn", pp. 6 plus one figure.

R. "Analysis of Covariance: Its Nature and Uses", by William Cochran. pp. 61.

S. "ANCOVA Lecture Problem", by Kenneth Hopkins. pp. 1.

T. "ANCOVA -- Problem Sets", by Kenneth Hopkins. pp. 8.

U. "Handout to Accompany Lecture on Repeated Measures Designs", by Gene V. Glass. pp. 2.

V. "A Critique of Experiments on the Role of Neurological Organization in Reading Performance", by Gene Glass. pp. 70.

I. Evaluation Instruments

A. Mastery Test on Experimental Design. 10 items, 2 pages.

B. Mastery Test on Rules of Thumb for Writing the ANOVA Table. 24 items, 4 pages.

C. Analysis of Covariance - Test Questions. 38 items, 3 pages.

D. Mastery Test on Consequences of Violation of ANOVA Assumptions. 6 items, 1 page.

E. Multiple Comparisons - Test Questions. 20 items, 3 pages.

F. Mastery Test on Repeated Measures Designs. 3 items, 1 page.

G. Unequal Subclass Numbers - Test Questions. 23 items, 4 pages.

H. Assessment of Judgments of Design and Analysis Concepts. Semantic Differential Format -- 14 concepts, 16 scales; 4 pages.

I. Formative Evaluation. 24 items, 1 page.

J. Participant Evaluation of Presession: 24 main categories of questions, 4 pages.

K. Staff Evaluation Form, 1 page.

EVALUATION

Formative Evaluation

Properly obtained and applied, information received from formative evaluation enables adjustments to be made in the on-going program. In this instance it was decided to attempt such an evaluation session during the course of the Pre-session.

Accordingly, a short questionnaire was prepared in advance which would provide that data by means of which the Director could decide whether changes in the schedule were necessary or not. The formative questionnaire was administered on Sunday evening. The questionnaire and a tabulation of responses for 25 randomly selected participants appear in Table 3.

Table 3

Formative Evaluation Questionnaire

Key: SA (Strongly Agree), A (Agree), ? (Undecided), D (Disagree), SD (Strongly Disagree).

	SA	A	?	D	SD
1. The objectives of this program were clear to me*	8	14	1	1	1
2. The objectives of this program were not realistic	0	1	6	9	9
3. The participants accepted the purposes of this program	3	10	2	3	6
4. The objectives of this program were not the same as my objectives	1	3	2	11	8
5. I have not learned much new	0	1	0	14	10
6. The material presented seemed valuable to me	12	11	2	0	0
7. I could have learned as much by reading a book	1	0	0	13	11
8. Possible solutions to my problems are not being considered	0	3	5	13	3
9. The information presented was too elementary	0	11	0	10	6
10. The speakers really know their subjects	22	3	0	0	0

---

*Participants were instructed to interpret the past tense as referring to the previous two days.

	SA	A	?	D	SD
1. I was stimulated to think about the topics presented	6	17	0	0	0
2. We worked together well as a group	6	10	6	2	0
3. The group discussions were excellent	3	9	9	4	0
4. There was little time for informal conversation	2	4	6	10	1
5. I had no opportunity to express my ideas	0	1	6	13	4
6. I really felt a part of this group.	1	16	6	1	0
7. My time was well spent	4	13	5	2	0
8. The program met my expectations	6	13	2	3	0
9. Too much time was devoted to trivial matters	0	0	1	16	6
0. The information presented was too advanced	1	4	4	11	3
1. The content was not readily applicable to much research in education	0	2	1	10	10
2. The assistants were very helpful	6	10	6	1	0
3. Theory was not related to practice	1	2	4	10	6
4. The schedule should have been more flexible	2	4	2	11	3

The formative questionnaire was scored immediately after its administration and as then studied by the Presession staff. It was felt that only three important mplications could be drawn: 1) The participants were generally quite satisfied ith the lectures and instructional aspects of the program; 2) The schedule appeard to be somewhat inflexible (Item #24); 3) Opportunities for small group discusions should be provided (Items #13, #14, #15). In an attempt to fit the program more losely to what the participants appeared to want, the Tuesday evening lectures were witched to Tuesday morning and replaced with discussions in small groups. Prior to uesday evening, topics for discussion groups were solicited from the participants. he entire group then broke into four small groups in which a common class of problems writing the ANOVA table, quasi-experimental designs, multiple comparisons, etc.) as discussed.

Subject-Matter Mastery Outcomes

Immediately following the lecture (and in some cases following the execution of problem sets after lectures) a short mastery test was administered to all participants. These tests were short multiple-choice type tests based on the content of the lecture (or lecture plus problem set) which had just ended.

The purpose of these tests was three-fold: 1) to capitalize on the motivating force of examinations, 2) to provide evidence to the staff of the success of their lecture, 3) to provide evidence to the participants of the success of their learning. None of these purposes required that the participants identify themselves by name on the test answer sheet; thus each participant marked his answer sheet with a code (birth date, social security number, etc.) which only he could identify. Immediately following the administration of a mastery test, the tests were collected and scored by the graduate-student assistants. The test scores were tabulated and given to the instructors who then decided whether a few minutes of a subsequent lecture ought to be devoted to the clarification of certain topics covered in the test. The scored tests were returned to the participants at the beginning of the instructional period following that one in which they were administered.

In all, seven mastery tests were administered. The obtained results for three of them are reported below. Two of the three tests for which results are given appear in Appendix II. (For a copy of the "Rules of Thumb" test see the Evaluation Report of the 1966 AERA Presession on Design of Experiments.)

Title: Consequences of violating ANOVA Assumptions

Score	Freq.
7	13
6	11
5	9
4	3
3	6
2	4
1	1

Title: Rules of Thumb for Writing the ANOVA Table

Score	Freq. ('67)	Freq. ('66)
24	6	8
23	7	9
22	4	3
21	2	3
20	8	3
19	2	9
18	3	4
17	2	0
16	0	3
15	2	0

itle: Repeated Measures Designs

core	Freq.
3	5
2	26
1	23
0	3

Title: Rules of Thumb for Writing the ANOVA Table (cont.)

Score	Freq. ('67)	Freq. ('68)
14	2	2
13	7	0
12	6	4
11	1	2
10	0	0
9	2	1
8		1
7		0
6		1

Comparative data are provided for the test "Rules of Thumb for Writing the ANOVA Table.". The left column of frequencies are those for the 18 participants in the 1967 Design Presession; the right column of frequencies are for 11 participants in the 1968 Design Presession, who were given the same test. Lest any invidious comparisons be drawn, we hasten to add that the lectures were different on the two occasions, slightly more time was devoted to the topic during the 1967 Design Presession, the tests were preceded by substantially different problem sets, not all 33 participants in the 1968 Presession turned in their tests, and the 1968 Presession participants were pretested on five of the items only eight hours before the full test was given.

Pretests of mastery were not administered in the 1967 Design Presession. There is ample evidence that one can show substantial pretest - posttest gains in subject-matter mastery from the evaluation of the 1966 Design Presession (see Table 10 of the Evaluation Report of the 1966 AERA Design of Experiments Presession). We wish to venture the opinion that pretesting (for the sole purpose of showing pretest - posttest gains) of subject-matter which the instructors have taught successfully to students on numerous occasions is simply a waste of precious time. Such pretesting is probably only justified when the instructor has serious doubts about his ability to teach a particularly difficult concept or when the participants are practically an unknown commodity. Pretesting to determine crucial entry behaviors which participants are assumed to possess is a different matter, however.

An instrument of the type commonly referred to as a "semantic differential" was constructed in an attempt to assess participants' conceptions of several concepts dealt with in instruction. A semantic differential is a rating technique used to elicit ratings from a person of each of several "concepts" with reference to each of several "scales." The scales are seven-point rating scales in which the extremes represent bi-polar adjectives and the center of the scale represents "neutrality", "no opinion", etc.

The semantic differential constructed comprised 14 concepts and 16 scales:

Concepts

1. The ANOVA Table
2. A 3-factor ANOVA
3. Non-parametric Tests
4. Analysis of Covariance
5. ANOVA Interaction
6. ANOVA Assump. of Indep.
7. Internal Validity
8. The Experimental Unit
9. Assump. of Equal Var.
10. Randomization
11. Scheffe Mul. Compar.
12. External Validity
13. Repeated Meas. Designs
14. Regression Effect

Scales

Clear	1 2 3 4 5 6 7	Unclear
Complex	1 2 3 4 5 6 7	Simple
Worthless	1 2 3 4 5 6 7	Valuable
Important	1 2 3 4 5 6 7	Unimportant
Vague	1 2 3 4 5 6 7	Precise
Logical	1 2 3 4 5 6 7	Illogical
Narrow	1 2 3 4 5 6 7	Comprehensive
Useful	1 2 3 4 5 6 7	Useless
Difficult	1 2 3 4 5 6 7	Easy
Practical	1 2 3 4 5 6 7	Theoretical
Incomprehen.	1 2 3 4 5 6 7	Comprehensible
Inexpensive	1 2 3 4 5 6 7	Expensive
Concrete	1 2 3 4 5 6 7	Abstract
Interesting	1 2 3 4 5 6 7	Uninteresting
Meaningless	1 2 3 4 5 6 7	Meaningful
Unsophisticated	1 2 3 4 5 6 7	Sophisticated

With this semantic differential, 14 (16) = 224 responses are recorded by each person. The semantic differential was administered during both the first and last sessions of the Presession. Pretest and posttest means on all 16 scales for 4 central concepts (which were so designated before the data were observed) are presented in Table 6. Substantial changes in ratings of concepts on several scales are apparent. (Intercorrelations of the 16 scales revealed a "complexity factor" - scales 2,9 and 16 - an "evaluation factor" - scales 3,4 and 8 - and a "concreteness factor" - scales 10 and 13.)

It is interesting to note that the participants tended to change from viewing the concepts as being theoretical and abstract on the pretest and to viewing them as more practical and concrete on the posttest. Perceived complexity tended to change little from pretest to posttest. Moderate changes toward viewing the concepts as more valuable, useful and important were also observed.

Table 6

Pretest and Posttest Means on the 16 Scales of the Semantic Differential for 4 Central Concepts

Concepts:	"2-factor ANOVA"		"ANOVA Interaction"		"Internal Validity"		"The Regression Effect"	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Scale								
Clear - Unclear	3.6	2.4	4.7	1.8	3.3	1.7	3.9	1.9
Complex-Simple	2.3	2.7	2.7	3.3	4.4	4.3	3.1	3.8
Worthless-Valuable	4.9	6.1	5.0	6.1	6.1	6.6	5.4	6.2
Import.-Unimport.	3.2	2.1	2.3	1.8	2.3	1.4	2.1	1.6
Vague-Precise	3.6	5.4	4.1	5.3	4.0	5.6	3.7	5.3
Logical-Illogical	3.2	2.1	2.6	1.7	3.1	1.6	2.8	1.9
Narrow-Comprehen.	4.7	5.4	4.3	5.2	5.2	5.7	4.4	5.1
Useful-Useless	3.1	2.1	2.4	1.8	1.8	1.4	2.1	1.7

Table 4 (cont.)

Concept:	"3-factor ANOVA"		"ANOVA Interaction"		"Internal Validity"		"The Regression Effect"	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Scale								
Difficult-Easy	2.3	3.2	2.3	4.0	4.3	4.4	3.6	4.1
Practical-Theoret.	3.6	2.9	3.2	2.6	3.6	2.4	3.0	3.0
Incom.-Comp.	4.3	5.6	4.2	5.6	3.6	6.2	4.8	6.0
Inexpensive-Expensive	4.3	4.4	4.0	3.8	4.4	4.2	4.4	3.9
Concrete-Abstract	4.7	3.4	4.5	3.3	4.1	3.3	4.2	3.9
Interesting-Uninteresting	3.0	2.1	2.3	1.6	2.3	1.6	3.0	1.8
Meaningless-Meaningful	4.4	5.8	4.7	5.9	5.7	6.3	4.8	6.2
Unsophisticated-Sophisticated	3.6	5.9	3.3	5.2	6.3	5.6	4.9	5.2

Assessment of Certain Non-Mastery Outcomes

An inventory of attitudes and opinions toward research practices was administered to all participants on the first and the last days of the 1966 Presession on Design of Experiments. An analysis of these data (see the Report of the AERA 1966 Presession on Experimental Design) revealed little change in attitudes toward research techniques occurring during the five-day session. For the 1967 Presession, a different approach to assessing non-mastery outcomes of instruction was taken. (See the preceding 3 pages.)

a) Staff Critique

At the end of the Presession, a 33-item questionnaire was given to each of the six staff members for completion. The questionnaire dealt with matters concerning the physical environment, the schedule, and the organization of the Presession; and allowed comments to be made by the staff regarding their perceptions of the participants. A copy of the instrument and a tally of the six staff members' responses appear in Table 5.

Table 3

Presession Critique for Staff Members

Indicate your observation and judgment by checking each item in one column at the left, then by amplifying your response in the blank at the right when appropriate. Use additional paper if needed. Items not applicable or not subject to your observation should be omitted. Be frank. (C = Commendable; S = Satisfactory; U = Unsatisfactory)

	C	S	U	
Tally:				1. Environmental conditions
	2	4	0	a. Classroom spaces
	2	4	0	b. Work spaces
	1	3	0	c. Living quarters
	0	7	0	d. Teaching equipment, aids (chalk boards, public address system, etc.)
	0	3	0	e. Resource material, library
	4	0	0	f. Eating facilities
				2. Participants
	0	6	0	a. Appropriateness of academic backgrounds
	0	2	0	b. Sufficiency of research experience
	2	1	0	c. Willingness to work
	4	2	0	d. Intellectual curiosity
	3	2	0	e. Concern for applicability of techniques
	4	2	0	f. Aspiration
	0	2	0	g. Immediate preparation for Presession
				3. Organization
	1	3	2	a. Adequacy of notice to prospective applicants
	4	2	0	b. Sufficiency of preplanning
	4	2	0	c. Smoothness of operation
	2	4	0	d. Adaptability to obstacles and feedback
	1	3	0	e. Sensitivity to grievances
	0	3	3	f. Adequacy of financial support
				4. Schedule
	1	5	0	a. Appropriateness of 5 days for the job
	1	5	0	b. Time spent efficiently
	2	4	0	c. Events sequenced appropriately
	2	2	1	d. Punctuality
	4	2	0	e. Balance between formal, informal affairs
	0	3	1	f. Quantity of discussion
	1	3	1	g. Quality of discussions
	4	2	0	h. Quality of formal presentations
	0	5	0	i. Unobtrusiveness of evaluation efforts
	0	4	0	j. Methods of evaluation
				5. Outcomes
	2	1	0	a. Intended content was actually taught
	3	2	0	b. Increase in participant understanding
	2	3	0	c. Improvement in attitude toward research
	1	3	0	d. Personal associations initiated

B) Participant Critique

The participants took full advantage of the opportunity offered to comment on the operation of the Procession. A summary of their responses, together with particularly germane comments, follows:

Question 1a. Did the unavailability of books and journals interfere with attempts to master the content of the Procession?

Yes 2
No 52

Although most people were undisturbed by lack of books, two recommendations did occur:

1. Handouts should have been given out before lectures or during.

2. Programmed instructional materials in Statistics would have been helpful.

Question 1b. Did reproduced material handed out by the staff help you?

Yes 54
No 0

Comments:

1. Participants requested that hand-out materials be made available for a longer period before the Procession to allow more time for assimilation.

2. Booklets were most especially helpful.

Question 1c. Did you lack a place to work?

Yes 11
No 43

Comments:

1. Needed a desk in the room (sleeping quarters).

2. Needed private place to study.

Question 2a. Was your room satisfactory?

Yes 43
No 11

Comments:

1. Room was hot
2. Room was small.
3. No desk.

Question 3a. Which features of the meeting rooms were inadequate?

	Freq.
Ventilation bad (including cigarette smoke)	9
Acoustics (inability to hear)	17
Too large and spread out	14
Needed overhead or neck microphone	18

Question 3b. Which features facilitated learning?

Space to spread out materials	8
Ice water	7
Public address system	3
Isolation from competing attractions (i.e. "big city")	6
Swimming pools and steam baths	3
Chalkboards	9
Raised platform for lectures	3

Question 4a.b. Was five days (a) too long, (b) too short?

	Too Long	Too Short
Yes	13	27
No	59	55
Omit	9	3

Many participants commented to the effect that although five days from morning until late at night were quite fatiguing, it would be wasteful not to use almost every available minute for at least four or five days.

Question 5a. Did you have enough time for your own activities?
b. Would you have preferred not to meet in the evening?
c. Would two meetings per day have been preferable?
d. Would you have preferred more meetings per day than there actually were?

	Yes	No
a.	20	53
b.	18	57
c.	15	57
d.	0	68

Question 6. Were lectures a. too long?
b. appropriately scheduled?

	Yes	No	Some
a.	7	36	2
b.	55	6	0

Most persons who thought some or all lectures were too long expressed preference for short lectures followed by more time for discussion or breaks in the middle of lectures.

Question 7. Did you have sufficient opportunity to interact with colleagues?

Yes	No
63	9

Comments:
1. Name-tags would have been helpful. (Excellent suggestion)
2. Do not see the need for two cocktail parties.

Question 8a. Were the instructors too unapproachable or inaccessible?
b. Were Graduate Student assistants helpful in solving your individual research problems?

	Yes	No
a.	0	52
b.	36	10

Question 9a. Did the evaluation interfere with your work?
b. Do you object to spending time on evaluation?

	Yes	No
a.	3	46
b.	2	48

Question 10. Was the Presession well organized?

Yes	47
No	0

Comments:
1. Very well.
2. "One of the most outstanding professional workshops I have ever attended."

Question 11a. Did the content of the lectures presuppose more training in mathematics and statistics than you had?

No	23
Yes	16
Yes (slightly more)	6

Comments:
"More pre-sessional reading is needed."

Question 11b. Should less, or more, training be presupposed?

Less	11
More	1
About right	30

Comments:
1. Divide groups into smaller groups on the basis of ability and training.

uestion 12. To what extent was the content relevant to what you hoped to accomplish?

Relevant	48
Not too relevant	1

Comments:

1. Somewhat too advanced.

Question 13a. Were the lecturers stimulating and interesting?
b. Were the discussions successful?
c. Were the lecturers competent to speak on their topics?
d. Were the lecturers well prepared?

	Yes	No	Omit
a.	49	0	2
b.	38	6	7
c.	44	0	7
d.	50	0	1

Question 14. Were you disappointed in any way with the participants?

Yes	No
2	49

Comments:

Too heterogenous; some were distracting during lectures; name tags are needed.

The participants answered each of the following only checking the more appropriate blank:

15. If you had it to do over again would you apply for this Presession which you have just completed? Yes 49 No 1 Omit 1

16. If a Presession such as this is held again would you recommend to others like you that they attend? Yes 51 No 0 Omit 0

17. Do you anticipate maintaining some sort of contact with at least one member of the Presession staff? Yes 43 No 8

18. Do you feel that your understanding of research design and/or statistical analysis has been considerably enriched in these five days? Yes 51 No 0

19. Do you feel that AERA is making an important contribution to education by sponsoring presessions such as this one? Yes 51 No 0

20. Do you feel that anything has happened during these five days to make it more likely that you will leave your present position of employment? Yes 12 No 39

21. Is it likely that you will collaborate in research with someone else attending this Presession (other than those you already were likely to collaborate with)? Yes 22 No 27 Doubtful 2

SUMMARY AND RECOMMENDATIONS

A. Presession Summary

Sixty-eight educational research workers met for four and one-half days in February 1966 to learn more about the design and analysis of educational experiments. The meeting was sponsored by the American Educational Research Association as a presession to its annual meetings. The U.S. Office of Education underwrote part of the expense.

Nine of the twelve sessions were lecture sessions. The content of the lectures concerned types of experimental designs, the analysis of variance and covariance, and multi-variate statistics. An elaborate evaluation of this meeting was carried out.

The participants were a heterogeneous group in terms of previous course work, area of specialization, age, and aspiration, though heterogeneity was reduced below that which existed in the 1966 Design Presession by selection of participants on variables found to be correlated with performance (see the report of the 1966 Design Presession). With few exceptions those selected to participate were persons who had completed doctoral programs and who had held responsibility for research. There was a considerable enthusiasm at the outset, and there was a considerable sense of gratification at the end. The participants were generous in their expressions of appreciation for the training opportunity.

Among the side-effect benefits to the participants were making of new contacts, the exchange of ideas with an intelligent and energetic group of colleagues, and the demonstrations of teaching of a subject matter which many of the participants will themselves be teaching.

The plans of the Presession and the expected outcomes of the Presession were examined and judged to be logically compatible, that is, judged that a reasonable plan had been drawn up to accomplish the indicated objectives. A second judgement was made by the evaluation team: that the Presession was conducted in a manner closely following the intent and expectation of the director and his staff.

The primary contributors to the success of the Presession appeared to be the relevance and abundance of the subject matter, the earnest receptivity and willing diligence of the participants, and the comfort and freedom from distractions of the resort at which it was held.

D. Issues, Comments, Recommendations

1. Site

a. Proximity to meeting site. There is but one apparent reason why the Presession should be in the same hotel as the annual meeting: that transfer takes time. Since checking out of one facility and into another can be done in an evening or even within an hour, the time lost is for transportation. It is reasonable to place the Presession in the general vicinity, perhaps within one hundred miles, of the Annual Meeting so as to conserve travel fare. The choice of a site should depend primarily on the selection of accommodations which facilitate good instructional activities. Most hotels have poor conference facilities, offer maximum distractions, are distant from resource materials, and offer inadequate meal facilities. Motels, particularly those adjacent to a campus, can be somewhat better. Throughout the country there are numerous conference facilities with rooms equipped with teaching aids; work and study areas; leisure areas for quiet, informal discussions; localized rooms for participants; and prompt meal service. These should be used.

The major departure of this Presession from the concurrent and past Presessions was that a site for the meetings was chosen primarily for its comfort and facilities instead of for nearness to the site of the AERA Annual Meeting. This Presession was conducted at Grossinger Resort Hotel in the Catskill Mountains some 90 or more miles north of New York City, the site of the Annual Meeting.

Grossingers was chosen because of its excellent food service (excellent meals were served and eaten within no more than one hour - as contrasted with the aggravating delays typically encountered in large hotels), recreational and entertainment facilities (our evening meeting could run until 10 P.M. and still give participants the opportunity to see a "show"), and convention facilities.

The time spent checking out of the hotel on Wednesday, traveling by chartered bus to New York City, and checking into the Annual Meeting hotel was only 2½ hours - far less time than might easily be wasted battling poor hotel service for meals and other services. The cost of traveling by bus from New York City to Grossingers and back was about $7.00. The cost of room, meals and recreation for the five days at the resort was under $125.00 per participant.

We can see no good reasons for locating Presessions in the Annual Meeting hotel or other large hotels near the Annual Meeting site; and there appear to be good reasons for not doing so.

b. Proximity to other Presessions. There are certain obvious advantages to locating more than one Presession in one place. Except in special circumstances, however, the availability of adequately equipped conference centers which can accommodate multiple meetings, adequate food services, and recreational facilities should govern this decision.

c. Special facilities. Library facilities, computational facilities, test files, laboratory spaces, or demonstration classrooms may be important enough to justify the location of a Presession far from the other meetings. However, their absence was rated "unimportant" in this Presession, probably because of the nature of the content.

5. Selection of Staff

a. Expertise. It is essential that each staff member has special enlightenment about the topic of the Discussion, that he has an ability to share his enlightenment, and that he is motivated to share it. It is less important that he can understand his audience, that he is willing to listen to others, or that he has a compelling personality.

b. Compatibility of staff. Successful conferences are often those which are staffed by persons who are accustomed to working together and who enjoy it. Specialization is not a major concern for a Discussion, but each staff member should make a unique contribution.

c. Full-time and partial availability. Those staff members who have been advertised as staff members should be on full-time duty with the Discussion. Others should be identified as guest lecturers or some such. Guest speakers are usually much more helpful if they have observed proceedings for half a day or more before making their contribution. If the staff members are not prominent, the scheduling of at least one prominent guest speaker is recommended.

d. Staff assistants. Graduate assistants proved to be very helpful. Their presence relieves a considerable amount of the burden of instructional and organizational details which weigh heavily on the instructional staff. However, the temptation is to employ more assistants than can be kept constructively busy for the entire session. Consideration should be given to employing assistants for less than the full five days. If provided, graduate assistants should be well coached as to their responsibilities.

e. (Also see 8 (b) below).

3. Selection of Participants

a. Size of group. The more a group size departs from the customary classroom number, the less prepared a colleague is to deal with it. Many conferences, including this Presession, have been successful with fifty or more participants.

b. Qualifications. No matter how carefully we set selection standards and study biographical data, the group turns out to be more heterogeneous than we had expected. However, biographical and professional data can be used predictively to reduce the heterogeneity of the group of participants.

Membership in AERA is not a meaningful criterion for selection of participants. Of 63 participants in the '67 Design Presession, 12 were not members of AERA.

c. If selection and notification of participants occurs as early as mid-December, it would probably not be unusual for as many as 10% of the original participant group to withdraw (for a variety of professional and personal reasons) before a Presession would begin in mid-February.

4. Application Procedures

a. Prior information. It can be very useful to the staff to have more complete statements of background and intent than are obtained on most application forms. This information can be solicited after selection but should be available to the staff several weeks before the Presession starts. Pretesting to determine the entry behaviors of the participant ought to be tried and evaluated in future Presessions.

b. Competition among Presessions. AERA should make a special effort to determine what competition there is among Presessions for the same members.

5. Plans for Instruction

a. Statement of objectives. After the director has made his proposal and the staff has agreed to serve, it is useful to have each staff member indicate briefly what he wants to accomplish. These statements give the writer a frame of reference for later planning, indicate opportunities for complementing the presentations of others, provide a base for some of the evaluation, and enable the director to make better-fitting arrangements. One way to exchange statements of intent is to have a planning meeting in the fall, another is to do it by mail.

b. Staff retreat. Many directors have found it useful to have the staff members spend an afternoon together discussing what roles each will play, what each hopes to accomplish in his sessions, and an overview of how he hopes to accomplish it. The presence of the director and one instructor for the '67 Design Symposium greatly facilitated planning.

4. Proceedings

a. Prior reading. Many participants have indicated a desire for study materials distributed several weeks in advance of the Symposium. Such materials are probably worth the effort for giving a general frame of reference for individual participants. It would be a mistake to assume that all the participants will attend to the materials or that the amount of heterogeneity will be reduced by such a distribution.

b. Opening session. There should be a session at the outset at which all staff members and participants are introduced and at which the director indicates his expectations for the proceedings to follow.

c. Attendance. What is expected of the participants in the way of attendance at sessions should be made clear to them. It is often sufficient to say that it would be disappointing if a high majority did not show up at all sessions but that it is up to the participant to decide whether or not to attend any particular session.

d. Lectures and discussions. The director and staff often feel that there is insufficient time to get said all that needs to be said and that most of the time should be spent in lecture sessions. The participants almost always react to these sessions to the effect that there should have been more opportunity for discussion. When generous allowance for discussion is made, participants often comment that a few monopolize the conversation. It often will be wise to allow for several discussions during a half-day session rather than single discussion period, with the final minutes given to staff presentation rather than discussion. An early opportunity to express himself seems to be an absolute prerequisite to learning from some participants. Opportunity for group rejection, assimilation, or adoption of ideas seems needed, especially during the middle days.

e. Didactic and inductive approaches. Although the inductive approach with illustrations and exercises tends to be much more time consuming than straightforward presentation of rules and generalizations, the response of participant groups is almost always more favorable to the former approach. Speakers should be encouraged to develop some of their points through the use of illustrative problems.

f. Personal consultation. The Staff should expect that a number of participants will bring forth personal research problems. The participants should not be discouraged from doing so and should get some attention to them, but the amount of time devoted to them should be resolved in terms of what is best for the participants and staff as a whole.

g. Closing session. There should be a formal session at the close of activities. It need not be long; it sometimes can feature a staff member's perspective of the future; it should give some closure to the consideration of the Presession's main themes; and it should include some expression of gratitude for the contributions made by the participants.

7. Evaluation

a. Responsibility. The responsibility for evaluation of the Presession as a whole should be recognized. Evaluations for new programs should be more expensive than those for old.

b. Formative evaluation. The director should expect to modify some aspects of his program and facilities and should use deliberate means to identify what modification is needed. Questionnaires prepared in advance of the session have the serious disadvantage of not anticipating specific operational difficulties which inevitably "crop up". The production of such questionnaires after one or two days of the program have elapsed is preferable.

c. Record. A formal record of proceedings should be made and kept by the director and by [illegible]. It should include a roster of participants.

d. Observation. An observer, who does not have instructional responsibilities, can make valuable observations for evaluation.

e. Testing. When there is a substantial content to the [illegible], some time should be given to testing for achievement. Pretest and posttest of subject-matter mastery appear to have little value. It is probably no longer necessary to document the fact that "learning occurs during [illegible]". Mastery tests following lectures and study sessions which are immediately scored, interpreted and returned to the participants seem more valuable to both staff and participants.

APPENDIX I

1967 AERA Presession
on
Design and Analysis of Comparative Experiments in Education

APPLICATION FORM*

If you are interested in applying after reading descriptions of the content, organization, and aims of the Presession, please fill out this form appropriately and mail it to Dr. Gene V. Glass, University of Illinois, 270 Education Building, Urbana, Ill. 61801.

General Information

Name____
Last First Initial

Age $\bar{x}$ = [illegible] s = [illegible] Male 56 Female 5

Mailing Address____

Present Institutional Affiliation (e.g., Harvard)______________________________

Educational History

Baccalaureate School______________________________ Year of Degree__________

Major____

Doctoral School__________________________________ Year of Degree $\bar{x}$ = [illegible] s = [illegible]

Major____

Check those courses in which you have earned either undergraduate or graduate credit:

	f		f
Statistical Methods	[illegible]	Calculus	[illegible]
Educational and Psychological Testing	[illegible]	Mathematical Statistics	[illegible]
Research Methods	[illegible]	Probability Theory	
Psychometric Methods	[illegible]		

Employment Responsibilities

Describe briefly the nature of your present employment. ______________________

____

What percent of your time is allotted to teaching? ___________________________

What percent of your time is allotted to research? $\bar{x}$ = [illegible] s = [illegible]

Which courses do you teach (if any) and at what level (undergraduate or graduate)?

Course	Level	
____________________	Graduate ______	Undergraduate ______
____________________	Graduate ______	Undergraduate ______
____________________	Graduate ______	Undergraduate ______
____________________	Graduate ______	Undergraduate ______

Approximately how many advisees do you have at the undergraduate level____________, at the graduate level ____________?

---

*At certain points, a summary ($\bar{x}$ for mean, s for standard deviation, and f for frequency) of the data gathered on 61 of the 66 participants is reported.

Professional and Scholarly Activities

What are your primary research interests (e.g., motivation, creativity, curriculum, development, concept learning)? ______________________________

How many research articles which you have authored alone or jointly have been accepted in a scholarly (refereed) journal? $\bar{x} = 3.46$; $s = 3.63$

In total, how many research articles, theses, or technical reports (both published and unpublished) have you authored alone or jointly? ______________________

How many funded (by USOE, NIMH, Ford Foundation, or other granting agencies) research projects have been completed on which your name appears as either the first or a joint author? $\bar{x} = 1.20$; $s = 1.09$

Have you presented a paper or appeared on a panel at the annual conventions of either AERA, [illegible], or [illegible] within the last five years? Yes_____ No_____

Do you expect to read a paper at such a convention within five years? Yes___ No___

List no more than three professional societies (e.g., AERA, APA) of which you are a member ([illegible] of the [illegible] participants were NOT members of AERA).

Reasons for Applying to this Presession

What were your reasons for applying Presession program? (Each row should get only one check mark.)	Check your one most important reason here	Check all other supporting reasons here	Check all reasons which were not relevant
To improve my ability to teach research design or statistics	________	________	________
To improve my skill in designing and analyzing experimental studies	(Applicants checked this reason most important almost uniformly)		________
To increase my knowledge of what design specialists are concerned about	________	________	________
To increase my appreciation of the usefulness of research design	________	________	________
To become better prepared to write proposals for the funding of research	________	________	________
To become associated with young and talented research workers	________	________	________
To develop or improve the design or interpretation of one particular study	________	________	________

Please offer any additional information which might assist the committee in reviewing your application.____

____

____

(If you wish, submit more information and a list of your publications.)

APPENDIX II

1967 AERA Presession on the Design and Analysis of Experiments

Mastery Test on Repeated Measures Design

1. Six persons were observed under four different treatment conditions. The proper analysis of variance model is a two-factor mixed model, persons (the random factor) crossing treatments (the fixed factor). An F-ratio, $MS_{Treat.} / MS_{Per. \times Treat.}$, of 3.25 was obtained.

Which one of the following conclusions is valid?

a. The F-ratio is significant at the .05 level.
b. The F-ratio is non-significant at the .05 level.
c. One cannot tell whether the obtained F-ratio is significant or non-significant at the .05 level because the degree of freedom for the F-test, which depend upon the unobserved population correlation matrix of the treatments, are not known.

2. In a particular repeated measures design, 20 subjects were observed under 5 treatments; thus a total of 100 observations are taken. An F-ratio, $MS_{Treat.} / MS_{Per. \times Treat.}$, was computed and compared with the 95 percentile in the F-distribution with 1 and 19 degrees of freedom. The null hypothesis was rejected at the .05 level using the conservative test.

a. The probability of a Type-I error for this design and this method of testing is exactly .05.
b. The probability of a Type-I error for this design and this method of testing is greater than .05.
c. The probability of a Type-I error for this design and this method of testing is less than or equal to .05.
d. There is no way of knowing the probability of a Type-I error for this design and this method of testing.

3. Which of the following repeated measures experimental designs is most likely to possess a population variance-covariance matrix which is permutation invariant, i.e., which is most likely to have a constant covariance from treatment to treatment?

a. A repeated measures design ($n = 10$, $J = 2$) in which Treatment A is always administered before Treatment B.

b. A repeated measures design ($n = 10$, $J = 4$) in which the order in which the four treatments are administered is independently randomized for each subject.

c. A repeated measures design ($n = 10$, $J = 3$) in which the three "treatments" are three separate intelligence tests measured on an IQ scale with mean 100 and standard deviation 15.

APPENDIX III

1967 AERA Presession in Design and Analysis of Experiments

Mastery Test on Consequences of Violation of ANOVA Assumptions

February 14, 1967

1. The kurtosis, B_2 , of the normal distribution is:

   a. e
   b. -3
   c. -2
   d. -1
   e. 0
   f. 1
   g. 2
   h. 3
   i. 5

2. An experimenter runs an ANOVA on data sampled from highly positively skewed distributions, though he believes the distributions to be normal. He chooses α to be .10. Given knowledge of the skewness of the distributions, the statistician has determined that if the null hypothesis is true, the probability of the experimenter making a Type-I error is .17.

   The actual level of significance is

   a. .01
   b. .05
   c. .10
   d. .17

3. (Table3) The null hypothesis that $M_1 = M_2$ is true and $\sigma_1^2 = 20$, $\sigma_2^2 = 100$, $n_1 = 80$, and $n_2 = 40$. The probability that the null hypothesis will be rejected if the experimenter is working at a nominal significance level of .05 is_________.
   (Fill in the blank)

4. (Table 9) Let $r = 1.0$, $J = 5$, $n = 3$ and $\alpha = .05$. What are the values of the skewness and kurtosis for which the power of the F-test is most discrepant from the theoretical normal-theory power? Skewness = _________ Kurtosis =_____

5. Heterogeneous variances pose a threat to the validity of the fixed effects ANOVA when

   a. the distributions are non-normal as well.
   b. n's are small
   c. the "degrees of freedom between" are small.
   d. the numbers of observations per group are unequal.
   e. None of the above. Heterogeneous variances do not pose a threat to the validity of the F-test.

6. Before performing almost any analysis of variance, Bartlett's test for homogeneity of variances

   a. should be made
   b. probably should not be made

PRESESSION IV

EDUCATIONAL RESEARCH MANAGEMENT PROCEDURES

Director

Dr. Desmond L. Cook
Research Management Center
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Columbus, Ohio

INTRODUCTION

Research Management Procedures was a five-day training course designed for personnel having direct responsibility for planning and conducting educational research projects. It was anticipated that the majority of participants would be principal investigators on individual research projects and administrative personnel from educational research bureaus and laboratories.

The Presession was designed to familiarize the participant with program budgeting concepts, cost-benefit analysis principles, network planning concepts, scheduling concepts, management reporting, and PERT applications in educational research and development.

This Presession was one of six intensive training courses in educational research sponsored by the American Educational Research Association aided by a grant from the Bureau of Research, U.S. Office of Education. The Presession was held on February 11-15, 1967, in connection with the 1967 AERA Annual Meeting.

OBJECTIVES

The objectives of the presession on Research Management Procedures were designed to enable participants satisfactorily completing the program to:

1. Apply program budgeting techniques and cost-benefit analyses in planning research project.
2. Apply network planning techniques in managing research projects.
3. Apply recently developed personnel management procedures in administering research projects.

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SCHEDULE OF ACTIVITIES

DAY	TOPIC	INSTRUCTOR	REFERENCE
Feb. 11 - AM	Administrative Matters Orientation Nature of Management Management Process Management Information Systems Research Management History of Networks	Cook	Cook, pp. 1-9 Cook - "New Approach" PERT Film
Feb. 11 - PM	Establishing Information Base Introduction to Networks Network Construction	Cook	Cook, pp. 10-19
Feb. 12 - AM	Establishing the Time Base Activity Time Estimation Network Analysis	Cook	Cook, pp. 19-31
Feb. 12 - PM	Work Session	Cook	
Feb. 13 - AM	Scheduling the Project Resource Allocation	Cook	Woodgate, Ch. 8, 12
Feb. 13 - PM	Establishing the Cost Base Program Budgeting	Cook Hindsman	Cook, pp. 31-34 PERT/Cost Film
Feb. 14 - AM	Computer Processing of Base Data Controlling as a Management Function Up-dating Management Reports Problem Identification Decision-making	Cook	Cook, pp. 72-76 Cook, pp. 77-83
Feb. 14 - PM	Application of Research Management Procedures to Education	Hindsman	Cook, Ch. 3
Feb. 15 - AM	PERT Implementation Summary Evaluation	Cook	Cook, pp. 83-86

Jan. 1967

SAMPLE MATERIALS

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Educational Research Management Center
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Columbus, Ohio 43210

Desmond L. Cook, Director

September 7, 1966

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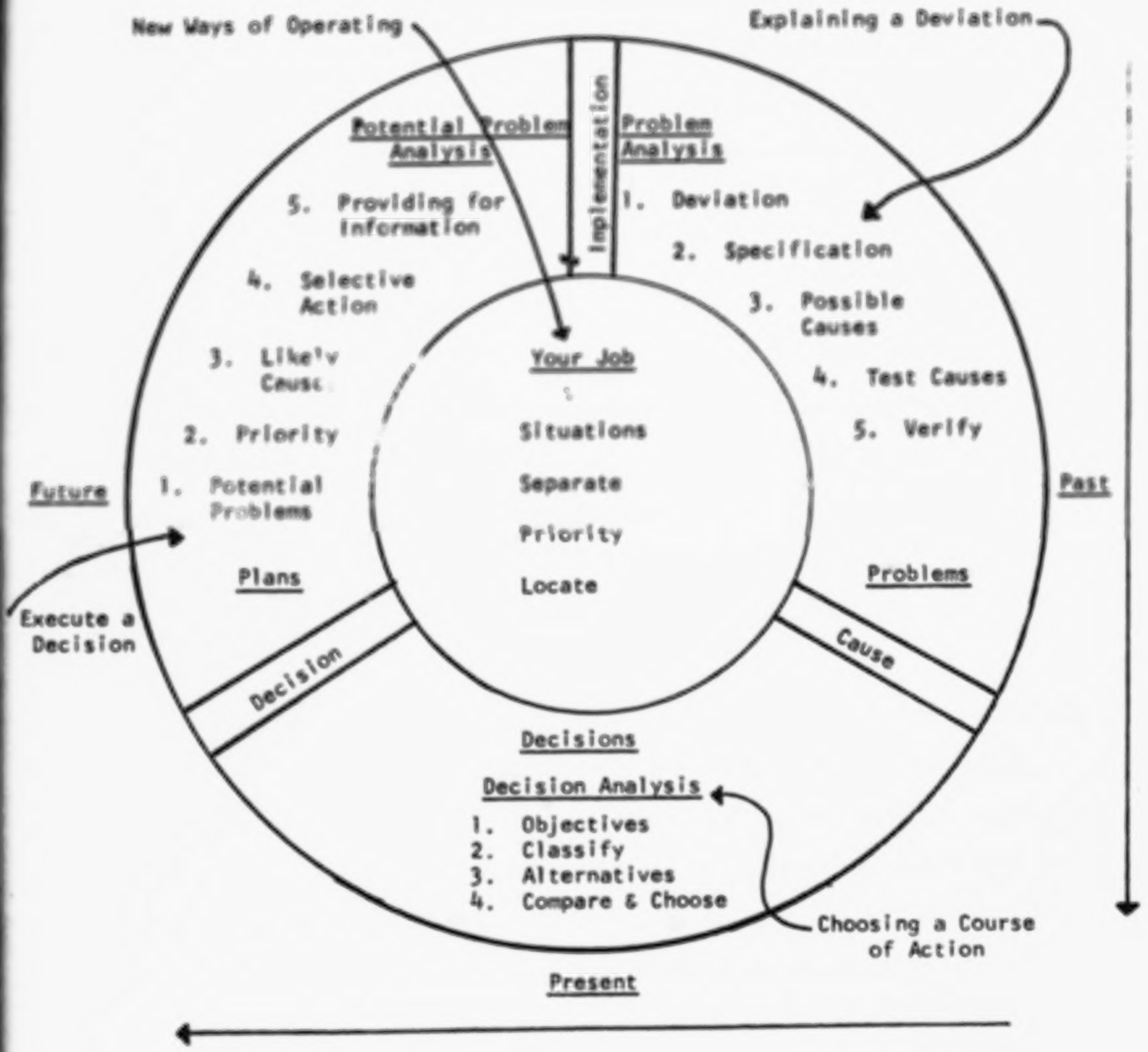
SAMPLE MATERIALS AND EXERCISES

KEPNER-TREGOE ACTION SEQUENCE


New Ways of Operating
Explaining a Deviation
Implementation
Potential Problem Analysis
5. Providing for information
4. Selective Action
3. Likely Causes
2. Priority
1. Potential Problems
Problem Analysis
1. Deviation
2. Specification
3. Possible Causes
4. Test Causes
5. Verify
Your Job
Situations
Separate
Priority
Locate
Future
Past
Plans
Problems
Execute a Decision
Decision
Cause
Decisions
Decision Analysis
1. Objectives
2. Classify
3. Alternatives
4. Compare & Choose
Choosing a Course of Action
Present

Adapted from: C. H. Kepner - B. B. Tregoe, The Rationale Manager, McGraw-Hill Book Co., 1965.

ACTION QUESTIONS

To Make The Process Work For You

PROBLEM ANALYSIS

Is This A Deviation?

How Important Is It?

What Info Do I Need To Specify The Problem?

What Possible Causes Does The Specification Suggest?

How Should These Be Tested?

DECISION ANALYSIS

What Objectives Should I Consider For This Decision?

Which Are Musts And Which Are Wants?

What Are The Alternatives?

Which Alternatives Satisfy Must Limits?

How Do These Compare On Wants?

What Are Their Adverse Consequences?

POTENTIAL PROBLEM ANALYSIS

What Potential Problems Could Impair This Choice?

What Are Their Most Likely Causes?

What Preventive Action Can I Take To Remove Cause?

What Contingent Action Can I Set To Minimize Problem Effects?

What Info Is Needed To Trigger Contingent Actions?

What Info Is Needed To Report Progress To Plan?

Situation

A presentation is to be delivered to a selected and limited audience. Formal invitations will be issued indicating the time and place, and including an outline or summary of the presentation. Attendees must forward replies to invitations since the one available conference room is small and chairs must be arranged in such a way as to avoid overcrowding and discomfort. In view of the time demands on most of the attendees, the presentation must be timed to run no more than one hour.

Problem

Develop a PERT network of the steps which must be taken to arrange for the presentation, starting with "Go Ahead" and ending with "Presentation Delivered."

A list of probable activities is shown below. Use as many of these as you feel necessary; add other activities at your discretion. Note that the activity listing below is completely random.

A Dry Running Presentation

B Arranging Chairs

C Delivering Presentation

D Preparing Invitations

E Revising Presentation

F Reserving Conference Room

G Preparing Speech

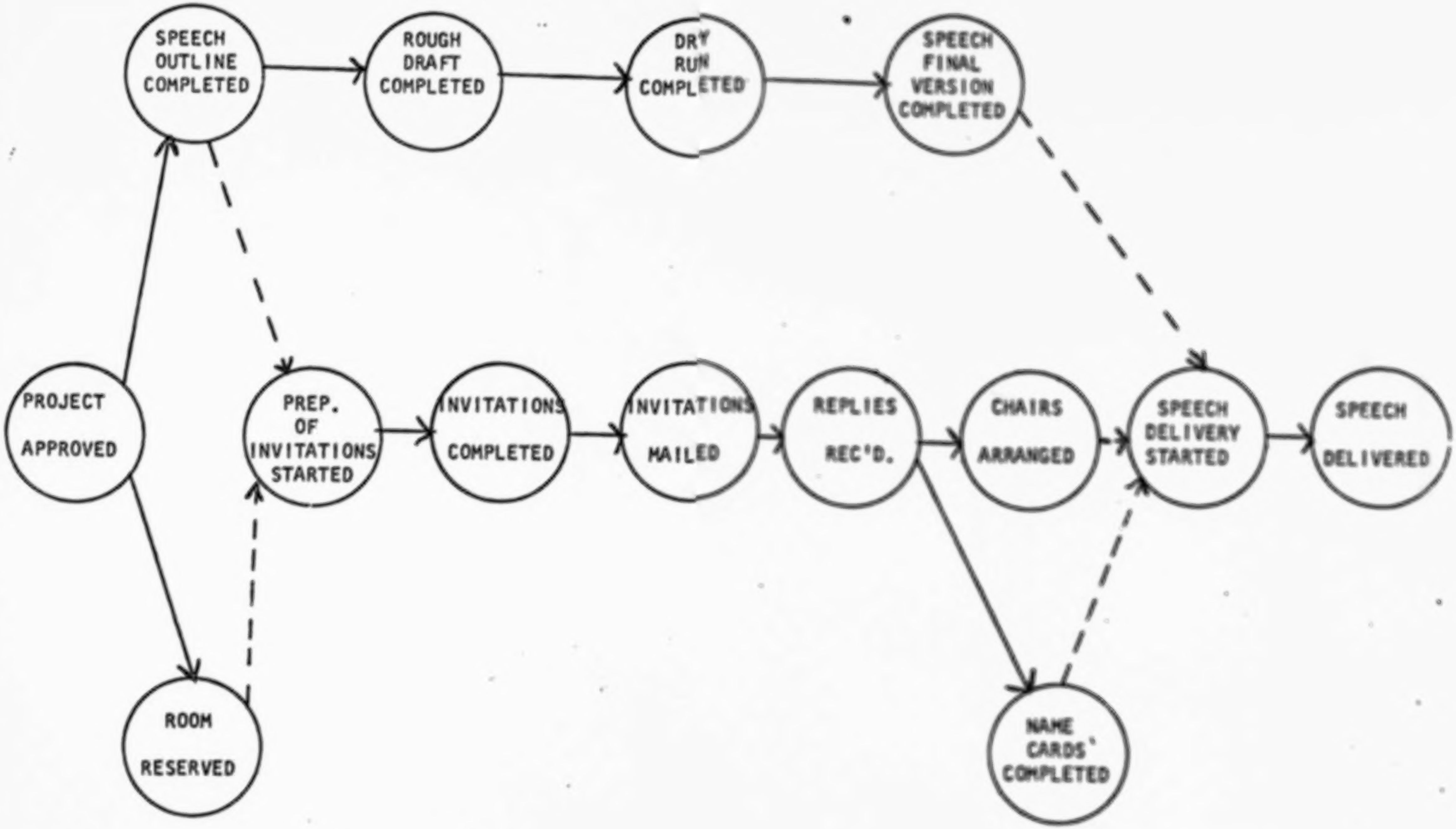
H Preparing Mailing List

I Preparing Presentation Outline

J Receiving Acceptance Replies

K Mailing Invitations

L Preparing Name Cards for Attendees


SPEECH OUTLINE COMPLETED
ROUGH DRAFT COMPLETED
DRY RUN COMPLETED
SPEECH FINAL VERSION COMPLETED
PROJECT APPROVED
PREP. OF INVITATIONS STARTED
INVITATIONS COMPLETED
INVITATIONS MAILED
REPLIES REC'D.
CHAIRS ARRANGED
SPEECH DELIVERY STARTED
SPEECH DELIVERED
ROOM RESERVED
NAME CARDS' COMPLETED

A SOLUTION TO SPEECH EXERCISE

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Logic Exercise No. 1

Given below are several statements reflecting the sequence and order of which certain events must occur. Your task is to draw a network to show or reflect the order in which the events must occur. Use the bottom of the page for drawing your network. Feel free to insert dummy activity lines as needed to show the necessary constraints.

1. "R" and "X" must both be finished before "O" can be done.
2. "B" contrains the start of "I".
3. "D" and "E" follow "B".
4. "I" follows "C".
5. "E" constrains the start of "X".
6. "X" follows "Q".
7. "H" precedes "R" and follows the ending of "E" and "I".
8. "B" and "C" follow "A", the initial event.
9. "D" precedes "Q".

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PRACTICAL EXERCISE NO. 1

Activity Identification

INSTRUCTIONS:

You are asked to study carefully the project description given below and to identify those activities which you feel constitute the major tasks of the project. Keep in mind that each one of you will see different activities to be accomplished for successful completion of the project. In order to provide continuity for the practical exercises, the PERT project staff has identified a list of activities which will be supplied to you as a solution. Use the reverse side to list the activities.

Professor A. B. See of Siwash University has been asked by his president to make a survey of faculty attitudes toward the parking situation on campus. When the survey has been completed, he is to turn in a written report of his findings to the president's office. Professor See has decided to employ the PERT technique for managing this little research project. After studying the PERT technique, he decides to prepare a plan in advance of actually conducting the work.

He decides to design a questionnaire to secure the necessary attitudes and to try out this questionnaire in order to secure ideas for revising it before establishing a final form. While Professor See has secretarial service, he does not have any facilities in his office to duplicate either the tryout or final questionnaire. Arrangements will have to be made for this work to be done on campus.

Since Professor See is a good researcher, he also wants to develop an adequate sample design. He recognizes that both a tryout sample as well as a final sample to whom the questionnaire will be administered in its tryout and final form will have to be selected.

Since the faculty is quite large, the volume of responses probably will be pretty great, so Dr. See desires to have the questionnaire responses key punched into IBM cards for further data processing. He has been allotted money to hire key punchers for this purpose but campus regulations state that he must arrange for key punching personnel with the local campus computing center before employing them. After the cards are punched, the data will be summarized by the campus computing center. Since the manner of key punching will be determined by the way the data is to be analyzed, Professor See wants to establish early a system for analyzing the data. After the data are summarized by the computing center, he will then analyze the results.

While the data responses are being key punched, summarized, and analyzed, Professor See wants to prepare some parts of the final report dealing with purpose and administrative procedures. Then he will complete the final report for submission to the president's office.

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SOLUTION TO PRACTICAL EXERCISE NO. 1

Activity Identification

Design Questionnaire

Tryout Questionnaire Duplication

Arrange for Key Punching

Tryout Questionnaire Administration

Design Data Analysis

Design Sample

Select Tryout Sample

Select Final Sample

Revise Questionnaire

Final Questionnaire Duplication

Final Questionnaire Administration

Key Punch Responses

Hire Key Punchers

Data Summary

Data Analysis

Final Report - Part I

Final Report - Part II

Submit Final Report to President

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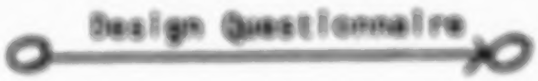
PRACTICAL EXERCISE NO. 2

Network Construction

Using the activity listing provided as the solution to Practical Exercise No. 1, prepare in the space below (or on the reverse side) a network which you think represents the sequence and interrelationships of the activities. Use circles to represent the start and completion of activities and solid arrow lines to represent each activity.

Describe each activity by writing a brief description on the line representing that activity. For example:



Feel free to use any dummy activity lines (--------->) necessary in order to properly establish the sequence of activities and their interrelationships.

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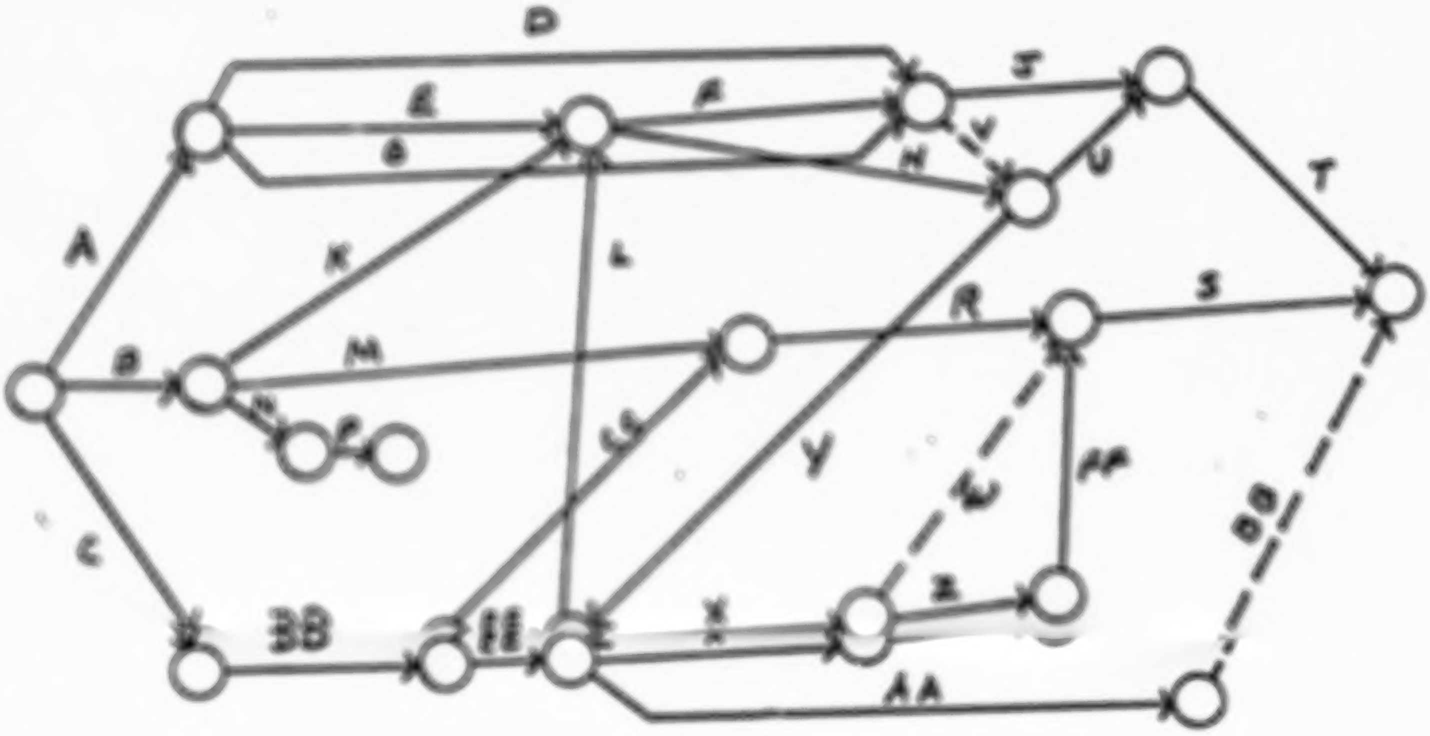
PRACTICAL EXERCISE NO. 2a

The network presented below contains several errors or unnecessary symbols. Study it carefully, then in the space below the network, list what you think are the errors or unnecessary symbols.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3B
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AA

Jan., 1966

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SOLUTION TO PRACTICAL EXERCISE NO. 2

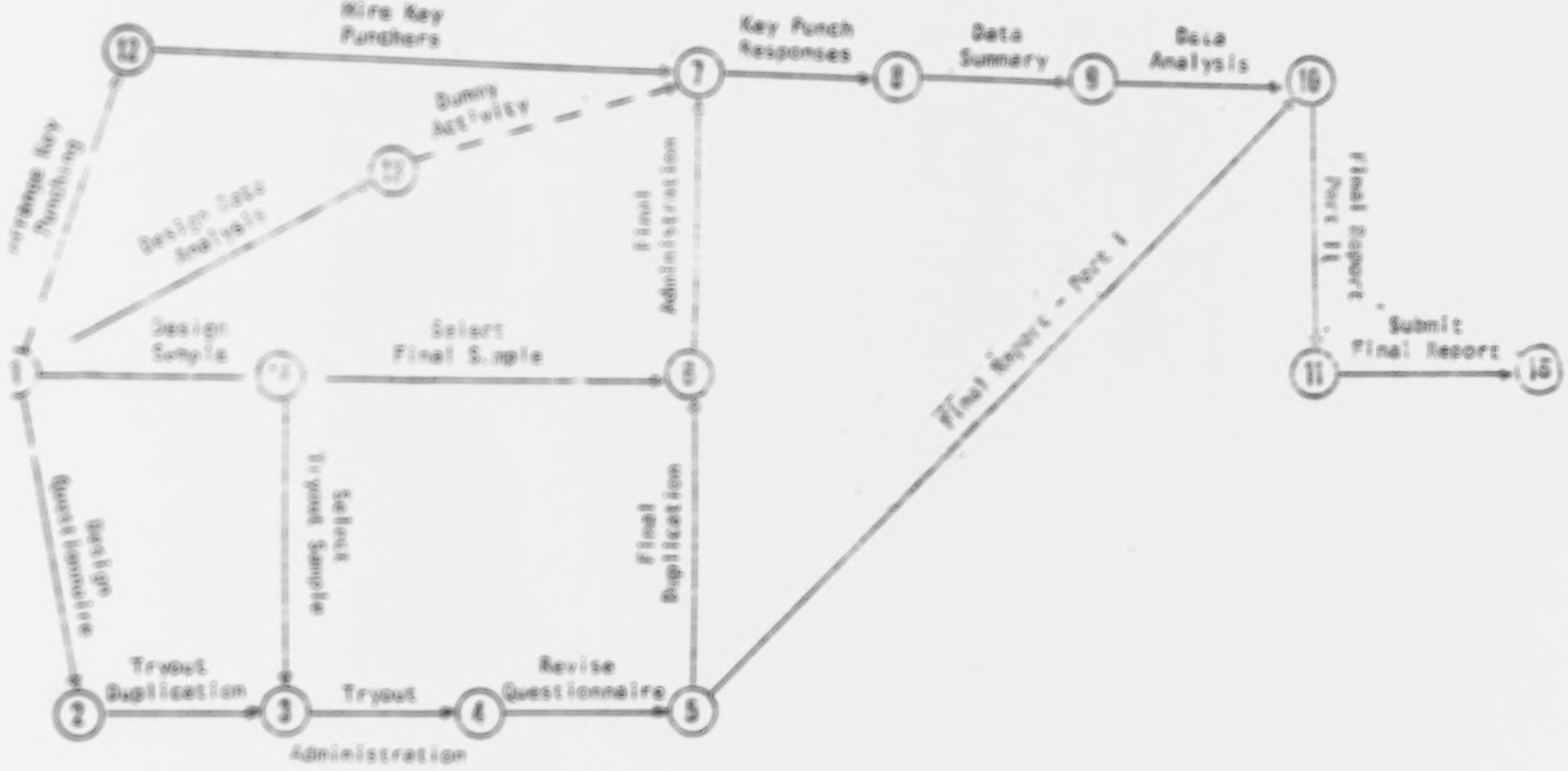
Network Construction

The network on the reverse side of this page has been prepared by the PERT Project staff as a solution to Practical Exercise No. 2.

In order to provide continuity for the succeeding exercises, numbers have been assigned to identify events and these are identified below.

Predecessor	Successor	
01	02	Design Questionnaire
02	03	Tryout Questionnaire Duplication
01	12	Arange for Key Punching
03	04	Tryout Questionnaire Administration
01	13	Design Data Analysis
01	14	Design Sample
14	03	Select Tryout Sample
14	06	Select Final Sample
04	05	Revise Questionnaire
05	06	Final Questionnaire Duplication
06	07	Final Questionnaire Administration
07	08	Key Punch Responses
12	07	Hire Key Punchers
08	09	Data Summary
09	10	Data Analysis
05	10	Final Report - Part I
10	11	Final Report - Part II
11	15	Submit Final Report to President
13	07	Dummy Activity

SOLUTION TO PRACTICAL EXERCISE NO. 2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15
Arrange Key Punching
Hire Key Punchers
Design Data Analysis
Dummy Activity
Design Sample
Select Final Sample
Design Questionnaire
Select Tryout Sample
Tryout Duplication
Tryout Administration
Revise Questionnaire
Final Duplication
Final Administration
Key Punch Responses
Data Summary
Data Analysis
Final Report - Part I
Final Report Part II
Submit Final Report

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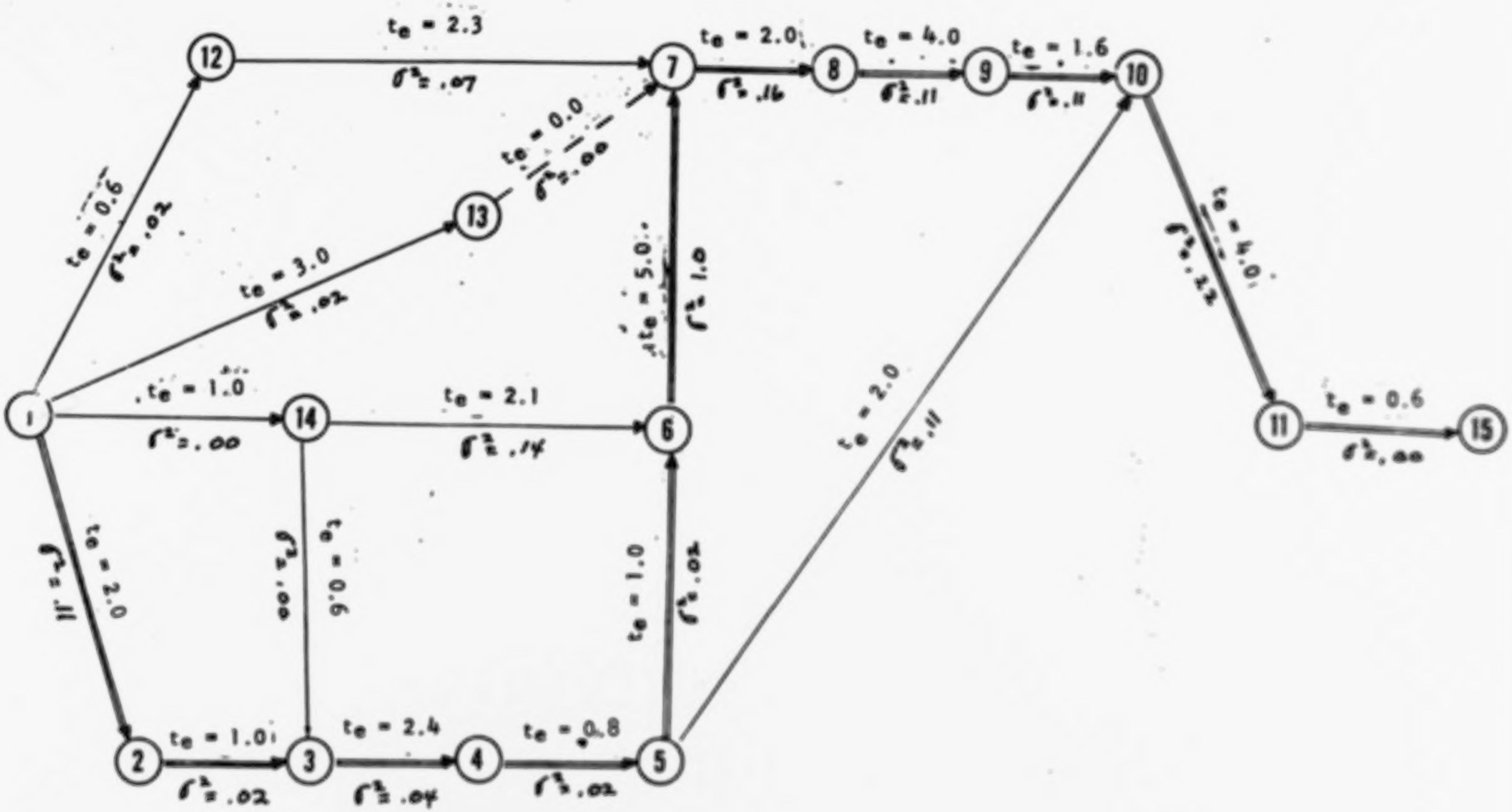
SOLUTION TO PRACTICAL EXERCISE NO. 3

Time Estimating

Event		Activity					
Predecessor	Successor	Description	a	m	b	t_e	σ^2
01	02	Design Questionnaire	1.0	2.0	3.0	2.0	.11
02	03	Tryout Questionnaire Duplication	0.6	1.0	1.4	1.0	.02
01	12	Arrange for Key Punching	0.2	0.6	1.0	0.6	.02
03	04	Tryout Questionnaire Administration	1.8	2.4	3.0	2.4	.04
01	13	Design Data Analysis	2.6	3.0	3.4	3.0	.02
01	14	Design Sample	0.8	1.0	1.2	1.0	.00
14	03	Select Tryout Sample	0.4	0.6	0.8	0.6	.00
14	06	Select Final Sample	0.8	2.2	3.0	2.1	.14
04	05	Revise Questionnaire	0.4	0.8	1.2	0.8	.02
05	06	Final Questionnaire Duplication	0.6	1.0	1.4	1.0	.02
06	07	Final Questionnaire Administration	2.0	5.0	8.0	5.0	1.00
07	08	Key Punch Responses	1.2	1.8	3.6	2.0	.16
12	07	Hire Key Punchers	1.6	2.2	3.2	2.3	.07
08	09	Data Summary	3.0	4.0	5.0	4.0	.11
09	10	Data Analysis	1.0	1.4	3.0	1.6	.11
05	10	Final Report - Part I	1.4	1.8	3.4	2.0	.11
10	11	Final Report - Part II	2.2	4.2	5.0	4.0	.22
11	15	Submit Final Report	0.4	0.6	0.8	0.6	.00
13	07	Dummy Activity	0	0	0	0	.00

SOLUTION TO PRACTICAL EXERCISE NO. 3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$t_e = 0.6$
$\sigma^2 = .02$
$t_e = 3.0$
$\sigma^2 = .02$
$t_e = 1.0$
$\sigma^2 = .00$
$t_e = 2.0$
$\sigma^2 = .11$
$t_e = 2.3$
$\sigma^2 = .07$
$t_e = 0.0$
$\sigma^2 = .00$
$t_e = 2.1$
$\sigma^2 = .14$
$t_e = 0.6$
$\sigma^2 = .00$
$t_e = 1.0$
$\sigma^2 = .02$
$t_e = 2.4$
$\sigma^2 = .04$
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$\sigma^2 = 1.0$
$t_e = 2.0$
$\sigma^2 = .16$
$t_e = 4.0$
$\sigma^2 = .11$
$t_e = 1.6$
$\sigma^2 = .11$
$t_e = 2.0$
$\sigma^2 = .11$
$t_e = 4.0$
$\sigma^2 = .22$
$t_e = 0.6$
$\sigma^2 = .00$

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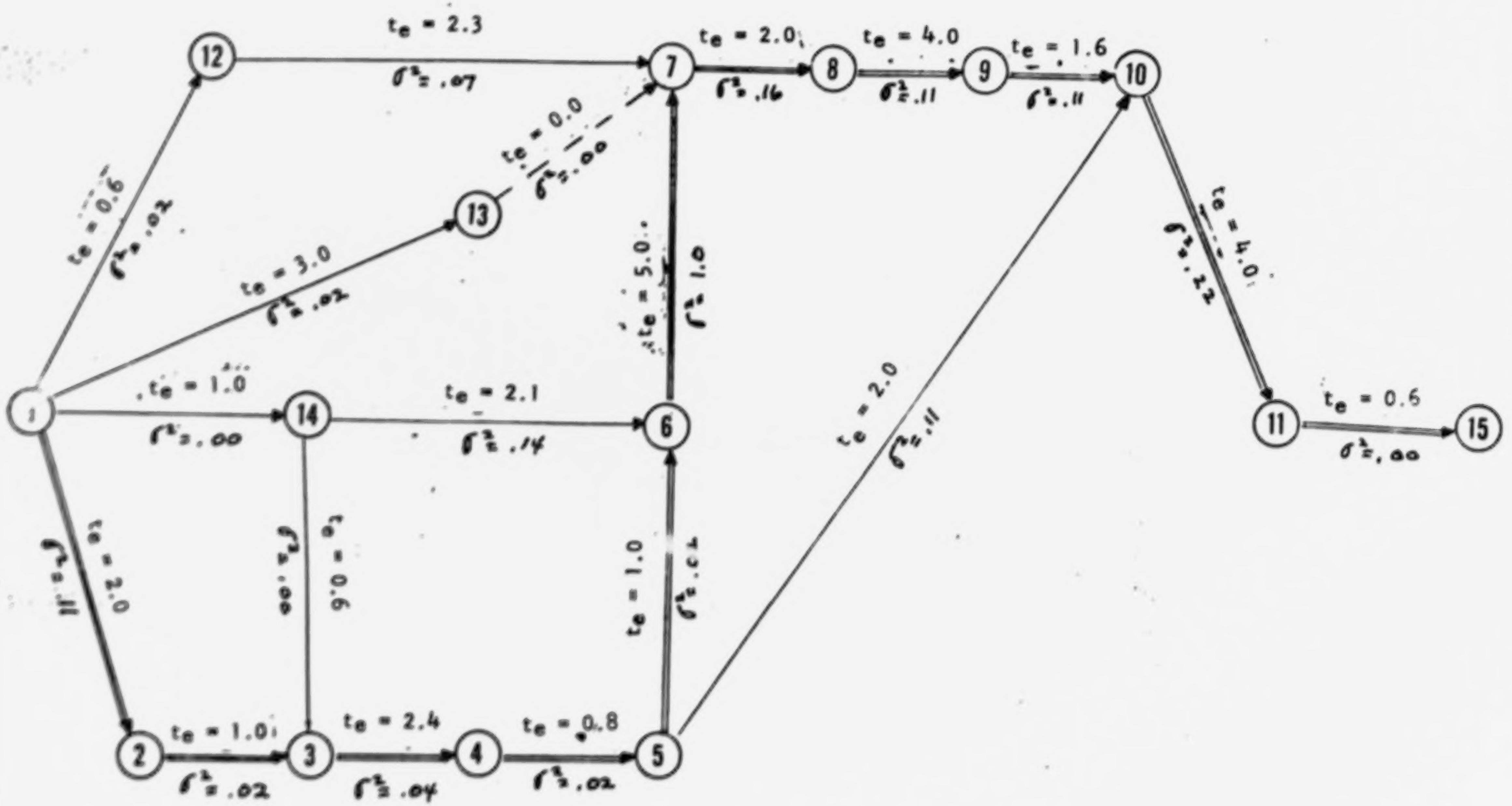
SOLUTION TO PRACTICAL EXERCISE NO. 3

Time Estimating

Event		Activity					
Predecessor	Successor	Description	a	m	b	t_e	σ^2
01	02	Design Questionnaire	1.0	2.0	3.0	2.0	.11
02	03	Tryout Questionnaire Duplication	0.6	1.0	1.4	1.0	.02
01	12	Arrange for Key Punching	0.2	0.6	1.0	0.6	.02
03	04	Tryout Questionnaire Administration	1.8	2.4	3.0	2.4	.04
01	13	Design Data Analysis	2.6	3.0	3.4	3.0	.02
01	14	Design Sample	0.8	1.0	1.2	1.0	.00
14	03	Select Tryout Sample	0.4	0.6	0.8	0.6	.00
14	06	Select Final Sample	0.8	2.2	3.0	2.1	.14
04	05	Revise Questionnaire	0.4	0.8	1.2	0.8	.02
05	06	Final Questionnaire Duplication	0.6	1.0	1.4	1.0	.02
06	07	Final Questionnaire Administration	2.0	5.0	8.0	5.0	1.00
07	08	Key Punch Responses	1.2	1.8	3.6	2.0	.16
12	07	Hire Key Punchers	1.6	2.2	3.2	2.3	.07
08	09	Data Summary	3.0	4.0	5.0	4.0	.11
09	10	Data Analysis	1.0	1.4	3.0	1.6	.11
05	10	Final Report - Part I	1.4	1.8	3.4	2.0	.11
10	11	Final Report - Part II	2.2	4.2	5.0	4.0	.22
11	15	Submit Final Report	0.4	0.6	0.8	0.6	.00
13	07	Dummy Activity	0	0	0	0	.00

SOLUTION TO PRACTICAL EXERCISE NO. 3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te = 2.3
σ² = .07
te = 3.0
σ² = .02
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te = 1.0
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σ² = 1.0
te = 2.0
σ² = .11
te = 2.0
σ² = .16
te = 4.0
σ² = .11
te = 1.6
σ² = .11
te = 4.0
σ² = .22
te = 0.6
σ² = .00

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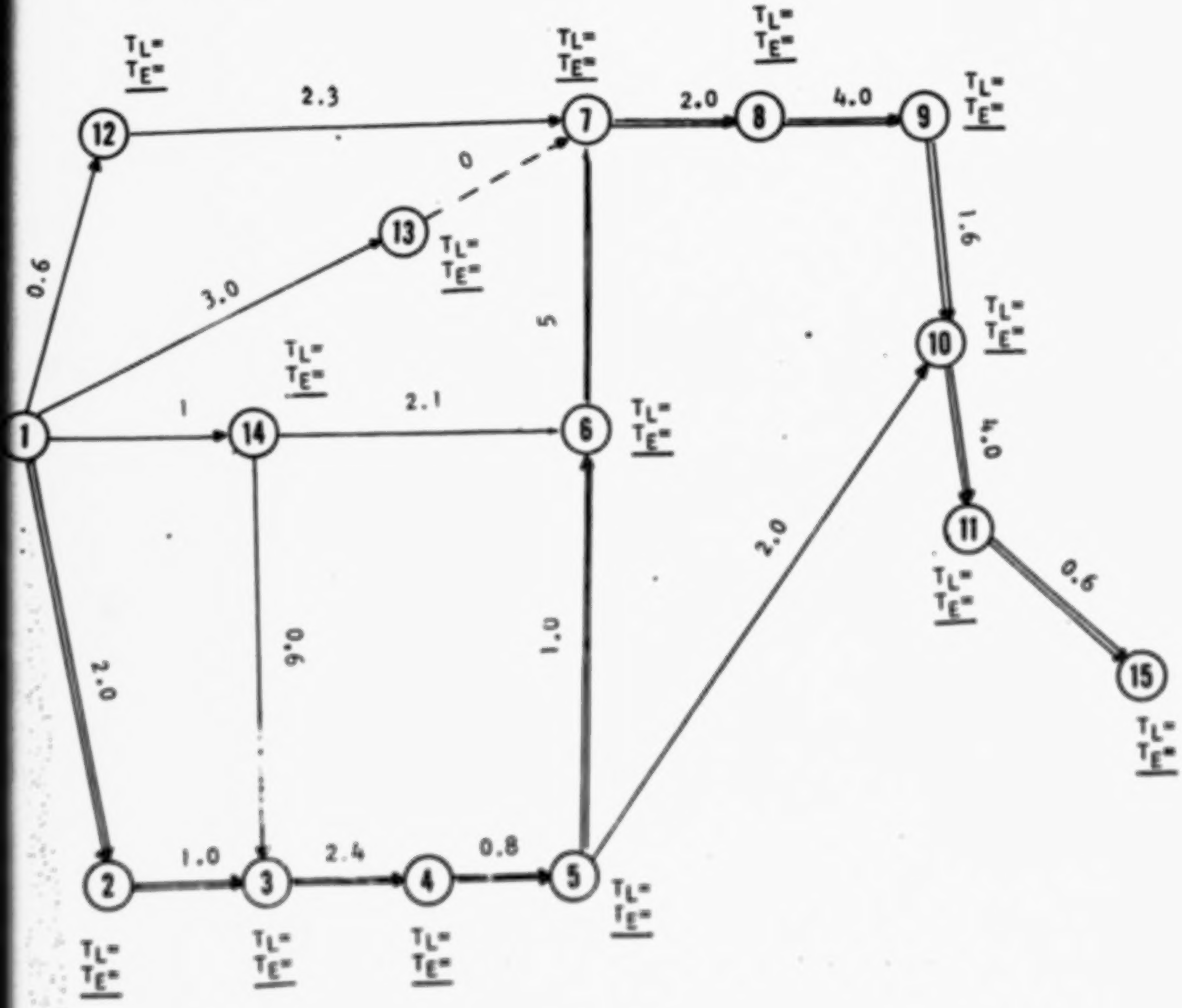
PRACTICAL EXERCISE NO. 4

Calculation of T_E, T_L, and Slack

Using the t_e's provided on the activity lines below, determine the Earliest Expected Date (TE) and the Latest Allowable Date (T_L) for each event. Enter them in the appropriate spaces on the network. In calculating these dates, remember the rule of selecting the largest time value when several activities come together at one event when going forward or to the right and the role of selecting the smallest time value when calculating the Latest Allowable Date when moving backward or going to the left from the end event. Calculate the slack associated with each event by subtracting T_E from T_L.



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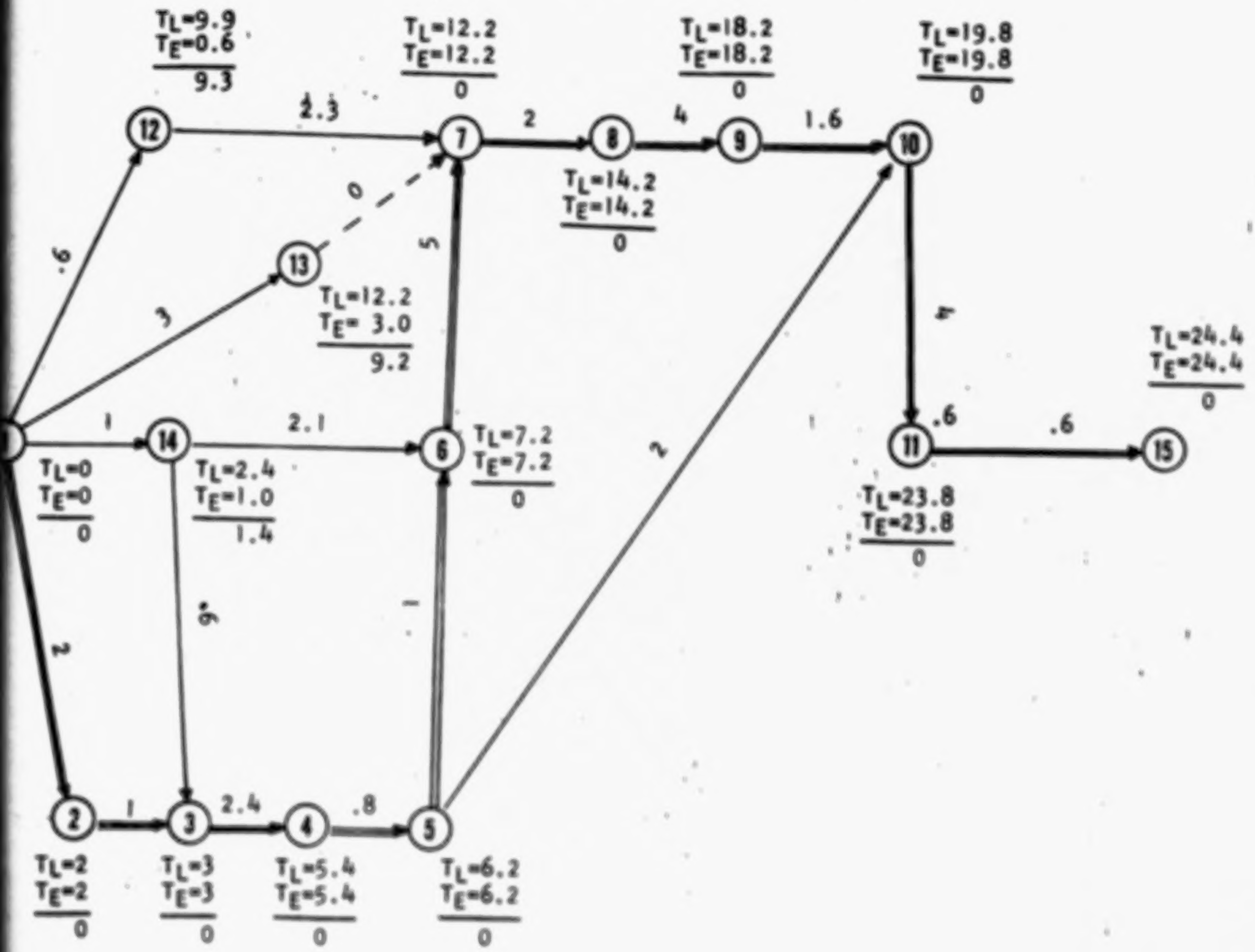
SOLUTION TO PRACTICAL EXERCISE NO. 4

Calculation of T_E, T_L, and Slack


T_L=9.9
T_E=0.6
9.3
T_L=12.2
T_E=12.2
0
T_L=18.2
T_E=18.2
0
T_L=19.8
T_E=19.8
0
2.3
2
4
1.6
12
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T_L=14.2
T_E=14.2
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0
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13
5
3
T_L=12.2
T_E= 3.0
9.2
4
T_L=24.4
T_E=24.4
0
1
14
2.1
6
T_L=7.2
T_E=7.2
0
2
.6
11
.6
15
T_L=0
T_E=0
0
T_L=2.4
T_E=1.0
1.4
T_L=23.8
T_E=23.8
0
.6
1
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2.4
4
.8
5
T_L=2
T_E=2
0
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T_E=3
0
T_L=5.4
T_E=5.4
0
T_L=6.2
T_E=6.2
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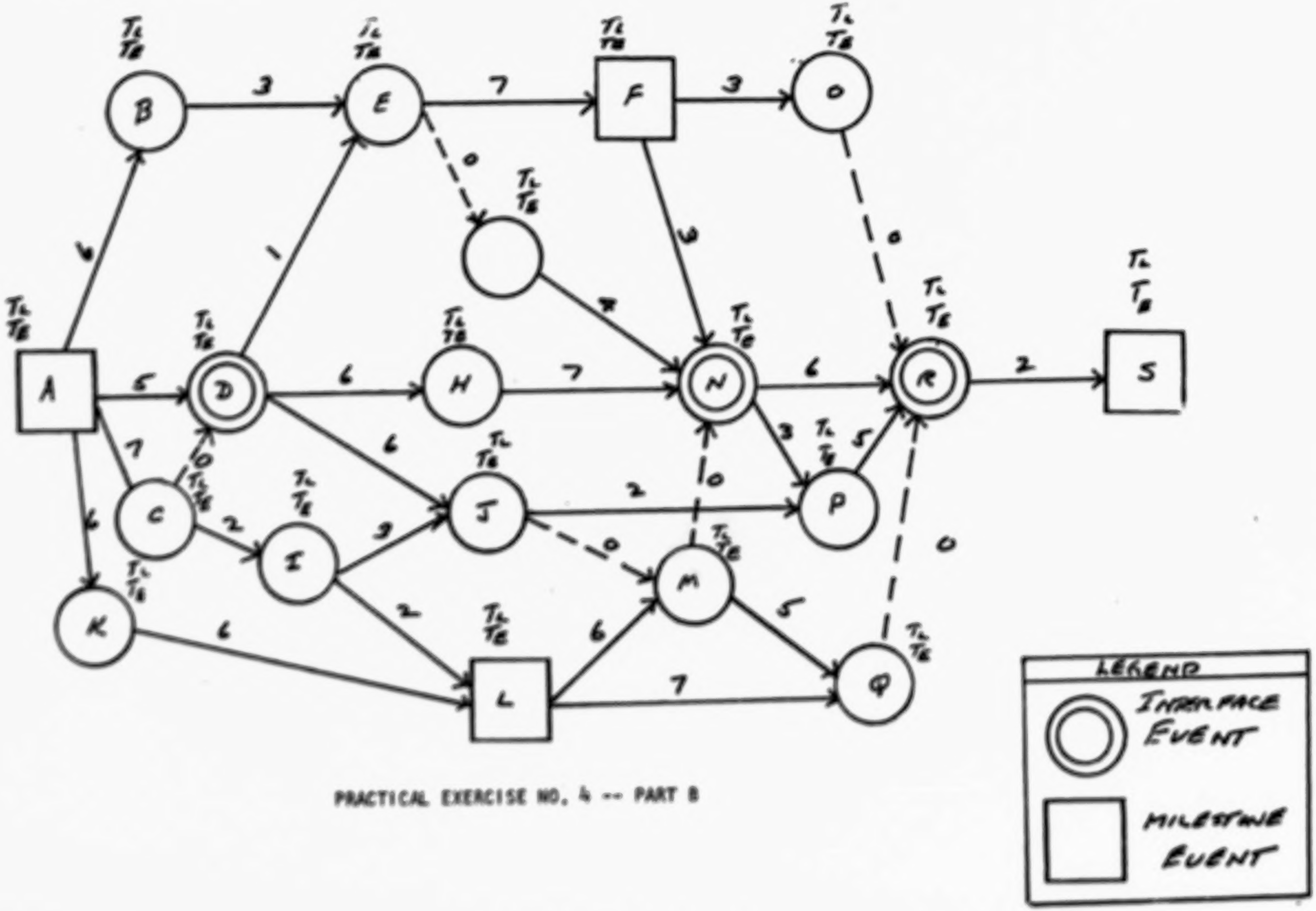
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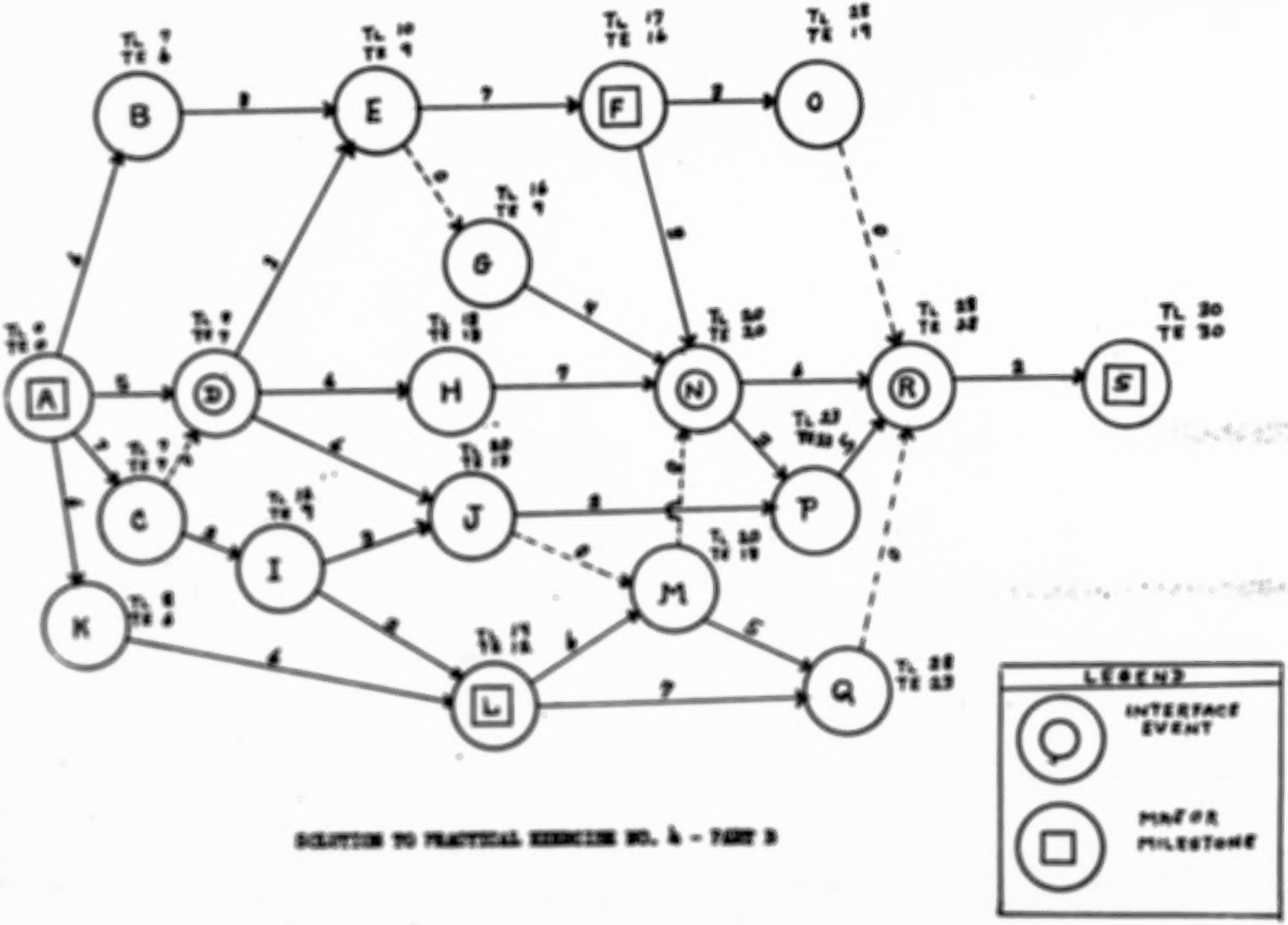
INTERFACE EVENT
MILESTONE EVENT

PRACTICAL EXERCISE NO. 4 -- PART B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INTERFACE EVENT
MAJOR MILESTONE

SOLUTION TO PRACTICAL EXERCISE NO. 4 - PART B

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PRACTICAL EXERCISE NO. 5

Scheduling - Part I

Professor See now wishes to schedule the project by establishing calendar dates for the earliest and latest start dates for each event on the assumption that the plan previously developed is acceptable. He knows that while t_e values are only estimates and that he could adjust them to establish scheduled elapsed items (t_s's), he decides to use the estimated values. Given below are the Critical Path followed by the various slack paths. Using the fiscal calendar attached, establish the earliest and latest start dates for each event. For example, event 2 cannot start until two weeks after the project starts. Running down the "accumulated time" column of the fiscal calendar, it can be seen that the date associated with 2 weeks is January 15. Note that the earliest and latest start dates for the Critical Path will be the same but this will not be true of the events on the several limit paths. Note also that the same event number has been used to indicate the start of several different activities.

Paths	Event No.	Event Description	T_E	T_L	Slack	ESD	LSD
Critical	1	Project Start	0.0	0.0	0		
	2	Start Tryout Duplication	2.0	2.0	0		
	3	Start Tryout Administration	3.0	3.0	0		
	4	Start Questionnaire Revision	5.4	5.4	0		
	5	Start Final Duplication	6.2	6.2	0		
	6	Start Final Administration	7.2	7.2	0		
	7	Start Key Punching	12.2	12.2	0		
	8	Start Data Summaries	14.2	14.2	0		
	9	Start Data Analysis	18.2	18.2	0		
	10	Start Conclusion of Final Report	19.8	19.8	0		
	11	Submit Final Report	23.8	23.8	0		
A	1	Start Sample Design	0.0	1.4	1.4		
	14	Start Select Tryout Sample	1.0	2.4	1.4		
B	14	Start Select Final Sample	1.0	5.1	4.1		
C	1	Start Design Data Analysis	0.0	9.2	9.2		
D	1	Start Arranging Key Punch	0.0	9.3	9.3		
	12	Start Hire Key Punchers	0.6	9.9	9.3		
E	5	Start Final Report - Part I	6.2	16.8	10.6		

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PRACTICAL EXERCISE NO. 5

Fiscal Calendar

1965

Jan.	4	0.2	Feb.	22	7.2	April	12	14.2	May	31	21.2
	5	0.4		23	7.4		13	14.4	June	1	21.4
	6	0.6		24	7.6		14	14.6		2	21.6
	7	0.8		25	7.8		15	14.8		3	21.8
	8	1.0		26	8.0		16	15.0		4	22.0
Jan.	11	1.2	March	1	8.2	April	19	15.2	June	7	22.2
	12	1.4		2	8.4		20	15.4		8	22.4
	13	1.6		3	8.6		21	15.6		9	22.6
	14	1.8		4	8.8		22	15.8		10	22.8
	15	2.0		5	9.0		23	16.0		11	23.0
Jan.	18	2.2	March	8	9.2	April	26	16.2	June	14	23.2
	19	2.4		9	9.4		27	16.4		15	23.4
	20	2.6		10	9.6		28	16.6		16	23.6
	21	2.8		11	9.8		29	16.8		17	23.8
	22	3.0		12	10.0		30	17.0		18	24.0
Jan.	25	3.2	March	15	10.2	May	3	17.2	June	21	24.2
	26	3.4		16	10.4		4	17.4		22	24.4
	27	3.6		17	10.6		5	17.6		23	24.6
	28	3.8		18	10.8		6	17.8		24	24.8
	29	4.0		19	11.0		7	18.0		25	25.0
Feb.	1	4.2	March	22	11.2	May	10	18.2			
	2	4.4		23	11.4		11	18.4			
	3	4.6		24	11.6		12	18.6			
	4	4.8		25	11.8		13	18.8			
	5	5.0		26	12.0		14	19.0			
Feb.	8	5.2	March	29	12.2	May	17	19.2			
	9	5.4		30	12.4		18	19.4			
	10	5.6		31	12.6		19	19.6			
	11	5.8	April	1	12.8		20	19.8			
	12	6.0		2	13.0		21	20.0			
Feb.	15	6.2	April	5	13.2	May	24	20.2			
	16	6.4		6	13.4		25	20.4			
	17	6.6		7	13.6		26	20.6			
	18	6.8		8	13.8		27	20.8			
	19	7.0		9	14.0		28	21.0			

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SOLUTION TO PRACTICAL EXERCISE NO. 5

Path	Event Numbers	Event Description	Earliest Start Date	Latest Start Date
Critical	1	Project Start	1/04/65	1/04/65
	2	Start Tryout Duplication	1/15/65	1/15/65
	3	Start Tryout Administration	1/22/65	1/22/65
	4	Start Questionnaire Revision	2/09/65	2/09/65
	5	Start Final Duplication	2/15/65	2/15/65
	6	Start Final Administration	2/22/65	2/22/65
	7	Start Key Punching	3/29/65	3/29/65
	8	Start Data Summary	4/12/65	4/12/65
	9	Start Data Analysis	5/10/65	5/10/65
	10	Start Conclusion of Final Report	5/20/65	5/20/65
	11	Submit Final Report	6/17/65	6/17/65
A	1	Start Sample Design	1/04/65	1/12/65
	14	Start Select Tryout Sample	1/08/65	1/19/65
B	14	Start Select Final Sample	1/08/65	2/08/65
C	1	Design Data Analysis	1/04/65	3/08/65
D	1	Start Arranging Key Punch	1/04/65	3/09/65
	12	Start Hire Key Punchers	1/06/65	3/12/65
E	5	Start Final Report - Part I	2/15/65	4/29/65

Jan. 1966

EVALUATION

Evaluation Scale

Directions: On each page of this booklet you will find a different concept to be judged and beneath it a set of scales. You are to rate the concept on each of these scales in order.

If you feel that the concept at the top of the page is very closely related to one end of the scale, place your check mark as follows:

fair __X__:_____:_____:_____:_____:_____:_____unfair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extreme) you should place your checkmark as follows:

strong_____:__X__:_____:_____:_____:_____:_____weak

If the concept seems only slightly related to one side as opposed to the other (but it is not really neutral), then you should check as follows:

active_____:_____:__X__:_____:_____:_____:_____passive

If the concept is neutral, or the scale is irrelevant to the concept, then place your checkmark in the middle space.

IMPORTANT: Place your check marks in the middle of spaces, not on boundaries.

Make each item a separate and independent judgement. Do not worry or puzzle over individual items. It is your first impression, the immediate feelings, about the items that we want.

RESEARCH MANAGEMENT

beneficial ______:______:______:______:______:______:______ harmful

sufficient ______:______:______:______:______:______:______ insufficient

soothing ______:______:______:______:______:______:______ aggravated

interpreted ______:______:______:______:______:______:______ unexplained

useful ______:______:______:______:______:______:______ useless

authentic ______:______:______:______:______:______:______ facsimile

concise ______:______:______:______:______:______:______ diffuse

constrained ______:______:______:______:______:______:______ free

intentional ______:______:______:______:______:______:______ unintentional

complex ______:______:______:______:______:______:______ simple

stable ______:______:______:______:______:______:______ changeable

rational ______:______:______:______:______:______:______ intuitive

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1967 AERA Presession - Research Management Procedures Evaluation Scale (Semantic Differential) Results

Concept	n	Pretest Mean	Posttest Mean	Mean Difference	Level of Significance 5%	1%
1. Research Management	36	60.00	65.25	5.25	S	S
2. Management Information Systems	35	58.36	63.31	4.94	S	S
3. P.E.R.T.	38	67.19	71.36	4.17	S	S
4. Planning	38	65.42	68.69	3.28	S	N.S.
5. Objectives	36	63.78	66.89	3.11	S	N.S.
6. Schedules	36	60.31	66.14	5.83	S	S
7. Budget	38	65.00	67.53	2.53	N.S.	N.S.
8. Control	36	60.64	65.14	4.50	S	S
9. Decision Making	39	64.72	70.78	6.06	S	S
10. Educational Research	36	55.94	60.00	4.06	S	N.S.

NOTES: 1. Variable n for each concept due to incomplete data on either pre- or posttest for that concept

2. Two tailed test employed using t statistic with 40 d.f.

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1967 AERA PRESESSION - Institute Evaluation Form - Summary of Responses

Statements	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%	f	%
1. The purposes of the institute were clear to me	28	58	19	40	0	0	1	2	0	0
2. The objectives of this institute were not realistic	1	2	1	2	0	0	26	54	20	42
3. Specific purposes made it easy to work efficiently	13	27	27	56	6	13	2	4	0	0
4. The participants accepted the purpose of the institute	13	27	29	60	4	8	2	4	0	0
5. The objectives of this program were not the same as my objectives	2	4	7	15	1	2	22	46	16	33
6. I didn't learn anything new	1	2	0	0	0	0	12	25	35	73
7. The material presented was valuable to me	31	65	15	31	1	2	0	0	1	2
8. I could have learned as much by reading a book	0	0	2	4	7	15	27	56	12	25
9. Possible solutions to my problems were considered	4	8	28	58	11	23	3	6	2	4
10. The information presented was too elementary	0	0	5	10	4	8	27	56	12	25

1967 AERA PRESESSION - Institute Evaluation Form - Summary of Responses (Cont'd)

Statements	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%	f	%
11. The instructors really knew their subject	30	63	17	35	0	0	1	2	0	0
12. I was stimulated to think objectively about the topics presented	25	52	21	44	2	4	0	0	0	0
13. New acquaintances were made which will help in future research	10	21	26	54	8	17	4	8	0	0
14. We worked together as a group	6	13	19	40	6	13	15	31	2	4
15. We did not relate theory to practice	0	0	0	0	1	2	29	60	18	38
16. The sessions followed a logical order	15	31	30	63	2	4	0	0	1	2
17. The schedule was too fixed	1	2	3	6	4	8	34	71	6	13
18. There was very little time for informal conversation	0	0	11	23	1	2	33	69	3	6
19. I did not have the opportunity to express my ideas	0	0	4	8	1	2	35	73	8	17
20. I really felt a part of this group	5	10	29	60	7	15	6	13	1	2
21. My time was well spent	23	48	23	48	1	2	1	2	0	0
22. The Institute met my expectations	17	35	24	50	2	4	5	10	0	0
23. I received no guide for further action	0	0	1	2	2	4	26	54	19	40

1967 AERA PRESESSION - Institute Evaluation Form - Summary of Responses (Cont'd)

Statements	Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%	f	%
24. Too much time was devoted to trivial matters	0	0	6	13	7	15	24	50	11	23
25. The information presented was too advanced	0	0	0	0	1	2	22	46	25	52
26. The content presented was not applicable to the work I do	2	4	1	2	1	2	22	46	22	46
27. Institutes of this nature should be offered again in the future	37	77	11	23	0	0	0	0	0	0
28. Institutes such as this will contribute little to educational research and development	0	0	0	0	0	0	14	29	34	71

PRESESSION V

MULTIVARIATE DESIGN AND ANALYSIS IN EDUCATIONAL RESEARCH

Director

Dr. Joe H. Ward, Jr.
Personnel Research Center
Lackland Air Force Base
Lackland, Texas

INTRODUCTION

The Presession on Multivariate Design and Analysis in Educational Research was designed for educational researchers who had the basic statistical tools in their repertoire, but because of the rapid improvement of computer techniques for the systematic organization and analysis of data were unable to formulate research problems for computer analyses that would yield answers to the questions at issue.

More specifically, this session was designed to develop an appreciation of multiple linear regression as a general approach to the formulation and analysis of research problems. The activities of the Presession were divided evenly between lecture-discussion, laboratory exercises related to the listed objectives, and exercises related to appropriate computer operations.

The participants were enabled to have direct experience with data processing and computer equipment. Each participant prepared a problem statement which reflected an acquisition of concepts and the development of attendant techniques that would be useful in his future conceptualization of research problems.

OBJECTIVES

The primary objectives of this session were to assist the participants in developing techniques of formulating research problems for computer analyses so as to make full use of the multiple regression approach. Upon successful completion of the program, participants were able to:

1. Define vectors that express the conceptualization of a problem.
2. Formulate models appropriate for specific problems without conforming to experimental designs for which prescribed computational procedures are available.
3. Identify vectors that represent information that has been measured on a continuum.
4. Define vectors so as to express nonlinear and interaction relationships.
5. Use categorical and continuous vectors in models developed to remove the "contamination" of other factors (logic of covariance analysis).
6. Apply an ambiguous set of rules to the determination of the appropriate degrees of freedom to be used with the linear regression model.
7. Cite novel examples of research problems to which linear regression is applicable.

STAFF

Dr. Joe H. Ward, Jr. (Director)
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Lackland Air Force Base

Dr. Earl Jennings (Instructor)
University of Texas

Dr. Robert Bottenberg (Instructor)
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Dr. Donna Gott (Instructor)
Personnel Research Center
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PARTICIPANTS

Participant Information Form

Information from Participants
AERA 1967 Presession in

MULTIVARIATE DESIGN AND ANALYSIS IN EDUCATIONAL RESEARCH

Participant's Name:
Address:

The information below is being requested from each person who HAS BEEN SELECTED TO ATTEND the Multivariate Design and Analysis in Educational Research Course. This information will be helpful in our attempt to make the course valuable to the participants.

1. Describe the characteristics of the high speed digital computer you now use or plan to use after completion of this course. (e.g., IBM 7040, 32K core, 6 tapes, disk)

2. Is the computer located at your own institution? If not, where is it located?

3. Describe your computer programming experience.

   3.1 Describe briefly the programs or sub-routines (and language used) that you have personally written and de-bugged.

   3.2 Describe briefly the computer programs written by someone else that you have used in your work. This means that you have prepared the control cards and arranged the entire deck in proper order for input to the computer.

   3.3 Describe briefly the computer programs that you have used in your work, but someone else has implemented the control cards and decks into the computer.

4. If you have written programs or used other programs, have you used variable format cards which are read in at object time to select information from data decks?

5. Can you use a key punch without any special instructions? (This does not mean that you know how to prepare drum control cards or that you are speedy.)

NOTE TO PARTICIPANTS:

This course will require participation through the entire day and much of the evening on each of the five scheduled days. Participants are urged to make arrangements for other meetings and entertainment while in New York City outside the schedule for the presession, February 11-15.

Return this to: Joe H. Ward, Jr.
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SCHEDULE OF ACTIVITIES

DAY 1 - SATURDAY 11 February, 1967

8:00 - 8:30 A.M. -- Participants gather at IBM Systems Research Institute, 787 United Nations Plaza, New York, New York

8:30 - 10:00 A.M. (Ward) -- Distribute Materials, Background and Objectives; Start Research Analysis Lecture (RAL), Chapter 1 of "Applied Multiple Linear Regression"

10:00 - 10:15 A.M. -- Break

10:15 - 12:00 A.M. -- Research Analysis Lecture (RAL) through 2.4; Linear Dependency if time - Definition and example using binary vectors.

12:00 - 2:00 P.M. -- Lunch and Laboratory (LAB), Individual Work

2:00 - 2:30 P.M. (Ward) -- Finish Linear Dependency

2:30 - 3:30 P.M. (Jennings) -- Computer Analysis Lecture (CAL) Discussion of Control Cards, Output of 3-variables problem without DATRAN

3:30 - 3:45 P.M. -- Break

3:45 - 5:30 P.M. -- Discussion of DATRAN, FORMAT. Participants make control cards, write DATRAN, FORMAT, and submit to Key Punch (Total Key Punching required approximately 300 cards)
Input to Computer at 5:30 P.M.
Distribute Problem Sets 1 and 2.

7:00 - 9:00 P.M. -- Laboratory (LAB) - Participants and Staff will work together as needed on individual basis.

DAY 2 - SUNDAY 12 February, 1967

8:30 - 9:00 A.M. -- Laboratory (LAB) - Participants receive computer output and make corrections for input to computer

9:00 - 10:00 A.M. -- SAL - Sections 2.3 through Chapter 2. 2x3 Problem, "Interaction", "Main Effect"

10:00 - 10:15 A.M. -- Break

10:15 - 11:30 A.M. -- SAL - Finish Chapter 2
(Ward)

11:30 - 12:00 A.M. -- CAL - Impose restrictions for "Interaction" and "Main Effects".
(Jennings)

12:00 - 2:00 P.M. -- Lunch and LAB

2:00 - 3:30 P.M. -- LAB to prepare 2x3 problem for Key Punch (Total key punch required approximately 1250 cards)

3:30 - 3:45 P.M. -- Break

3:45 - 5:00 P.M. -- SAL - Chapter 3
(Ward)

5:00 - 5:30 P.M. -- LAB

7:00 - 9:00 p.m. -- LAB

DAY 3 = MONDAY 13 February, 1967

8:30 - 9:00 A.M. == LAB

9:00 - 10:00 A.M. == SAL - Assumptions underlying the model
(Bottenberg)

10:00 - 10:15 A.M. == Break

10:15 - 11:00 A.M. == CAL - 2 Prediction problem
(Jennings) (Total Key Punching required 300)

11:00 - 12:00 A.M. == SAL - Assumptions underlying the model, and 3-way
(Bottenberg) analysis if time permits

12:00 - 2:00 P.M. == Lunch and LAB

2:00 - 3:30 P.M. == SAL - Chapter 5
(Ward)

3:30 - 3:45 P.M. == Break

3:45 - 5:30 P.M. == CAL - Covariance Problem and LAB
(Jennings) (Total Key Punching required 700)

7:00 - 9:00 P.M. == LAB

DAY 4 - TUESDAY 14 February, 1967

8:30 - 9:00 A.M. == LAB

9:00 - 10:00 A.M. == BAL - Topics in Chapters 5 and 6. Test for Non-Linearity, Discontinuity, Policy Capturing, Set with missing cells.

10:00 - 10:15 A.M. == Break

10:15 - 12:00 A.M. == CAL and LAB - Test for Non Linearity
(Jennings)

12:00 - 2:00 P.M. == Lunch and LAB

2:00 - 3:30 P.M. == BAL - Topics in Chapter 5 and 6

3:30 - 3:45 P.M. == Break

3:45 - 5:30 P.M. == CAL and LAB

7:00 - 9:00 P.M. == LAB (Total Key Punch required 1000)

DAY 5 - WEDNESDAY 15 February, 1967

8:30 - 9:00 A.M. == LAB

9:00 - 10:00 A.M. == BAL

10:00 - 10:15 A.M. == Break

10:15 - 12:00 A.M. == LAB

12:00 - 2:00 P.M. == Lunch and LAB

2:00 - 3:30 P.M. == LAB

3:30 - 3:45 P.M. == Break

3:45 - 5:30 P.M. == Final Lecture, Evaluation and LAB

5:30 P.M. == End of Presession (Total Key punch required 1000)

SAMPLE MATERIALS

TOPICS RELATED TO THE COMPUTATIONAL ASPECTS OF REGRESSION

By

Joe H. Ward, Jr.

1. Linear Combinations of a set of vectors.

2. All possible Linear Combinations generate a Linear vector space.

3. Linear Dependence of a set of vectors.

4. A set of Independent vectors which span the vector space are called a basis set. A basis set is not unique.

5. The number of vectors in a basis is called the dimension of the vector space.

6. Inner Product of two vectors. $x' y$ (Distinguish from Direct Product).

7. Orthogonality. $x' y = 0$. (Compare Orthogonality and Linear Independence.)

8. Length of a vector. $= \sqrt{x' x}$

9. Cosine of Angle. $(x' y) / (\sqrt{x' x}) (\sqrt{y' y})$

10. Orthonormal set of vectors.

11. If a vector is orthogonal to each vector of a set, then it is orthogonal to every vector in the space generated by the set.

12. Decomposition of a vector into two orthogonal components.

13. Orthogonal decomposition of a vector yields a residual of minimum length.

14. Decomposition of a vector into two orthogonal components, one in the space of a set of vectors and the second a residual orthogonal to the space generated by the set.

THE COMPUTATION OF THE F STATISTIC

By

Joe H. Ward, Jr.

The following material discusses the computation of the F statistic in terms of predictive accuracy and the dimension of the vector spaces associated with the prediction systems.

1. THE LARGEST MODEL.

Consider the prediction of y from $x(1)$, $x(2)$, ..., $x(n)$ where each vector $x(i)$ has its i-th element equal to 1 and all other elements equal to 0. These n vectors are linearly independent and the dimension of the vector space generated by these vectors is n.

Then $y = a_1 x(1) + a_2 x(2) + \ldots + a_n x(n) + e$

Let $\hat{y} = a_1 x(1) + a_2 x(2) + \ldots + a_n x(n)$

Then $y = \hat{y} + e$

In this problem the least squares regression coefficients are

$$a_i = y_i \quad (i = 1,n)$$
$$\text{and} \quad \hat{y} = y$$

The residual vector e is the NULL vector

Now let $\sum_{i=1}^{n} y_i^2 = E_y$ associated with this value consider the dimension of the vector y and call the dimension $d(E_y)$ with value n, i.e. $d(E_y) = n$

$\sum_{i=1}^{n} a_i^2 = R_1$ associated with this value consider the number of independent vectors in the set $x(1)$, $x(2)$, ..., $x(n)$. This is the dimension of the space, $d(R_1) = n$

COMPUTATION OF THE F STATISTIC

$\sum_{i=1}^{n} e_i^2 = S_E = 0$ since E is the NULL vector the sum of squares $S_E = 0$. Associated with this vector E is defined $d(S_E) = 0$

Then write

$S_y = S_1 + S_E$ $\quad d(S_y) = d(S_1) + d(S_E)$

$S_y = S_1 + 0$ $\quad n = n + 0$

$S_y = S_1$ $\quad n = n$

2. THE [illegible] MODEL.

Now consider the prediction of y from a set of independent vectors $x(1)$, $x(2)$, ..., $x(k)$ = (where $k<n$). Each of these vectors can be expressed as a linear combination of $u(1)$, $u(2)$, ..., $u(n)$.

Then $y = a_1x(1) + a_2x(2) + \dots + a_kx(k) + e$

Let $u = a_1x(1) + a_2x(2) + \dots + a_kx(k)$

Then $y = u + e$

Assume that a_i $(i = 1,k)$ are least squares values

Then let $\sum_{i=1}^{n} u_i^2 = S_u$ associated with this value consider the number of independent vectors in the set $x(1)$, $x(2)$, ..., $x(k)$. This is the dimension of the space, $d(S_u) = k$

$\sum_{i=1}^{n} e_i^2 = S_e$ associated with this residual vector is the number $d(S_e)$ with value equal to $n - k$

Then we can write

$S_y = S_u + S_e$ $\quad d(S_y) = d(S_u) + d(S_e)$

$n = k + (n-k)$

$n = n$

COMPUTATION OF THE F STATISTIC

3. THE RESTRICTED MODEL

Finally, consider the prediction of y from a set of independent vectors $x(1)$, $x(2)$, ..., $x(r)$ (where $r<k$). Assume that each of the vectors can be expressed as a linear combination of $x(1)$, $x(2)$, ..., $x(k)$.

Then $y = b_1x(1) + b_2x(2) + \ldots + b_rx(r) + E$

Let $\hat{y} = b_1x(1) + b_2x(2) + \ldots + b_rx(r)$

Then $y = \hat{y} + E$

Assume that $b_i (i = 1, r)$ are least squares values.

Then let $\sum_{i=1}^{n} \hat{y}_i^2 = R_r$ associated with this value consider the number of independent vectors in the set $x(1)$, $x(2)$, ..., $x(r)$. This is the dimension of the space, $d(R_r) = r$

$\sum_{i=1}^{n} E_i^2 = E_r$ associated with this residual vector is the number $d(E_r)$ with value equal to $n-r$

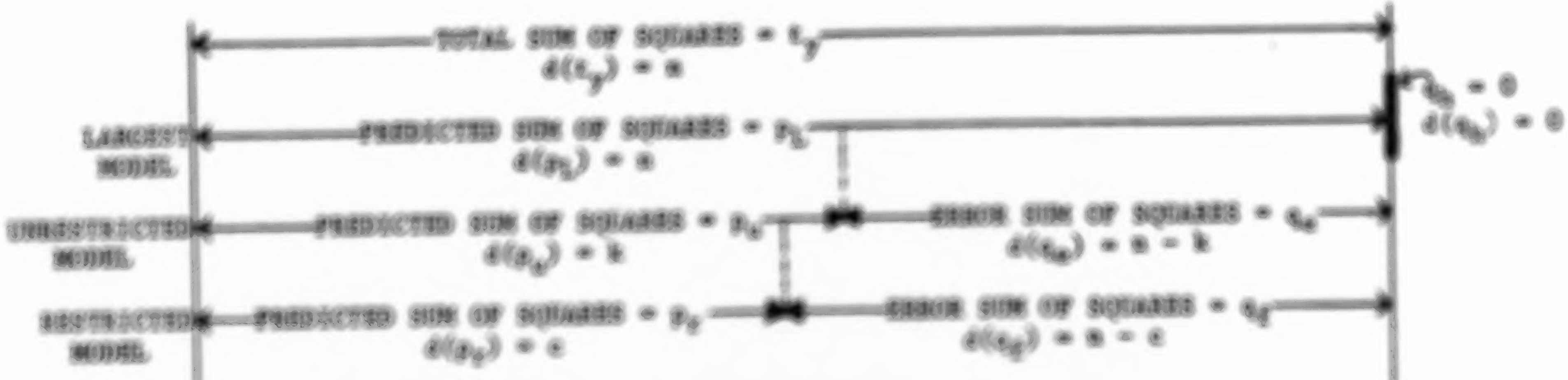
Then we can write

$Y_y = R_r + E_r$ $\quad$ $d(Y_y) = d(R_r) + d(E_r)$

$n = r + (n-r)$

$n = n$

PICTORIAL REPRESENTATION OF THE F STATISTIC


TOTAL SUM OF SQUARES = t_y
$d(t_y) = n$
$e_L = 0$
$d(e_L) = 0$
LARGEST MODEL
PREDICTED SUM OF SQUARES = p_L
$d(p_L) = n$
UNRESTRICTED MODEL
PREDICTED SUM OF SQUARES = p_u
$d(p_u) = k$
ERROR SUM OF SQUARES = e_u
$d(e_u) = n - k$
RESTRICTED MODEL
PREDICTED SUM OF SQUARES = p_r
$d(p_r) = c$
ERROR SUM OF SQUARES = e_r
$d(e_r) = n - c$

WE CONSIDER:

1. The lost prediction accuracy per vector given up between LARGEST and UNRESTRICTED models.

2. The lost prediction accuracy per vector given up between UNRESTRICTED and RESTRICTED models.

$$\frac{p_L - p_u}{n - k} = \frac{e_u}{n - k} \qquad \frac{p_u - p_r}{k - c} = \frac{e_r - e_u}{(n-c)-(n-k)} = \frac{e_r - e_u}{k - c}$$

Then we compare these two values as a ratio and have:

$$F = \frac{(e_r - e_u)/(k - c)}{e_u/(n - k)} = \frac{(R^2_{\text{UNRES.}} - R^2_{\text{RES.}})/(k - c)}{(1 - R^2_{\text{UNRES.}})/(n - k)}$$

Use of Unit Vector and Other Comments on PERSUB Regression Program

By Robert A. Bottenberg

Questions occasionally arise regarding the necessity for specifying a unit vector as input data when using Persub regression routines. In order to clarify the role of the unit vector, it will be helpful to distinguish between (a) a conceptual regression model together with an implied computational procedure for its solution, and (b) the version of the model and the computational procedure used by the Persub routines. To review first, what appears in the usual regression model is a set of variables in their raw score form. These consist of observed values, transformations of them such as squares, cubes, products, square roots, logs, etc., and coded binary variables to represent group membership or the presence or absence of some characteristic. Also included in such a set of raw score variables is usually, though not necessarily, a "variable" which takes the value of 1 for all observations. This last variable is what is ordinarily referred to as a unit vector. Its standard deviation is, of course, 0. The "correlation" of such a variable with any other variable would in a mathematical sense be undefined because its s.d. is 0, but its correlation with other variables may, in fact, be treated as a defined quantity by a computer program when such a variable is specifically introduced as a member of an array of variables. Computer programs are ordinarily constructed so as to arbitrarily set the correlation of a variable having an s.d. of 0 with any other variable to 0.

Let the raw score conceptual model be denoted by M, and be of the form

$$X_c = A_1X_1+A_2X_2 + \dots +A_pX_p + E,$$

where X_c is the criterion variable in its raw score form, X_1, X_2, ..., X_p are predicator variables in their raw score form, A_1, A_2, ..., A_p are raw score weights, and E is a raw score residual vector. Assume for the present that one of the predicators, X_p, is the unit vector. In order to minimize the sum of the squared elements

E, we would need to solve a system of p equations in the p unknowns $a_1, a_2, \ldots, a_p$. The coefficients of the unknowns in these equations would be the sums of squares and cross products of the vectors $X_1, X_2, \ldots, X_p$, and the right side of the i(th) equation would be the sum of cross products of the raw scores in X_i and X_c. One reason for including the unit vector X_p as a predictor vector is that the other predictors, $X_1, X_2, \ldots, X_{p-1}$ are all continuous vectors. If the unit vector was not included, the prediction system would be required to predict a criterion score of 0 whenever the values on the continuous predictors are all 0. It may be desirable to avoid such a requirement as a general rule on the following grounds. If the unit vector is included, but expected criterion score should in fact be 0 when the value on all continuous predictors is 0, the chances are good that the estimated weight associated with X_p will turn out to be 0, or nearly so. So no harm is done to the prediction system by the inclusion of the unit vector, even if it makes no contribution to the criterion. On the other hand, if it is arbitrarily excluded from the conceptual model, but it does in fact contribute to the criterion; the prediction system will turn out to be in error. There are special situations in which it is desired to have a model which does not include the unit vector. But as will be evident from what follows, the use of Persub to handle models which include only continuous vectors will require special methods. As mentioned later, the use of a unit vector in the conceptual model when the other vectors include an array of binary vectors which sum to the unit vector is no special problem with regard to the conceptual model. The Persub regression computing routines have been constructed so as to obtain one of the unlimited number of least squares solutions for a regression system when there are linear dependencies in the conceptual model.

The Persub regression routine does not actually tackle directly the problem of obtaining a solution for a regression system for a model, M, which includes raw score variables, $X_1, X_2, \ldots, X_{p-1}$, and the unit vector, X_p. Instead, it obtains the solution for another regression model, m, which is closely related to M. The model solved by Persub is of the form

$$z_0 = a_1 z_1 + a_2 z_2 + \cdots + a_{p-1} z_{p-1} + e,$$

where z_0 is the standardized form of X_0, that is an element of X_0 is obtained by subtracting the mean of all elements in X_0 for the corresponding value in X , and dividing the difference by the s.d. of elements in X_0. Similarly the variables z_1, z_2, ..., z_{p-1} are the standardized forms of X_1, X_2, ..., X_{p-1}, the elements in e are residuals, and the p-1 a's are chosen so as to minimize the sum of squares of elements in e.

The solution for the a's in model a requires obtaining the solution to a set of p-1 equations in which the unknown are a_1, a_2, ..., a_{p-1}. The coefficients of the unknowns in these equations are the sums of squares and cross products of the variables z_1, z_2, ..., z_{p-1}. But these sums of squares and cross products are simply N times the inter-correlations, and the right side of each equation is N times the validity coefficient. So if each equation is divided through by N, the equations to be solved have the inter-correlation matrix of the z_i as coefficients of the unknown a's, and the vector of p-1 validity coefficients appear on the right side. Note in passing that the inter-correlations and validities of the X_i are the same as the inter-correlations and validities of the z_i. The [illegible] routine finds a solution to a close approximation for this set of p-1 equations. The accuracy of the solution is shown by the size of the "equation errors" which are reported on the print-out. The equation error reported along with standard weight a_i on the print-out is obtained by putting the computed values of a_1, a_2, ..., a_{p-1} into an equation in which the coefficients of the a's are the appropriate elements from the i(th) row of the correlation matrix of predictors. This weighted sum of the a's should, if the solution for the a's is exact, be identical to the validity coefficient of X_i for X_0. Any difference between the weighted sum and the validity coefficient is due to the fact that the solution is approximate rather than exact, and the difference is referred to as an equation error. If the solution were exact, all equation errors would be 0. Ordinarily, equation errors which are reported are small, usually less than .005. The solution can be made more exact and the equation errors made generally smaller by specifying a more rigorous stop criterion, for example, .00001 rather than .0001.

There is a relationship between the β's in model A and the a's in model B. The relationship is that $a_i = s_i \cdot \beta_i$, for i = 1, 2, ..., p-1, where s_i is the ratio of the s.d. of X_c to the s.d. of X_i. Having obtained the values of a_1, a_2, ..., a_{p-1}, the value of a_p is given by the difference between the mean of X_c and the weighted sum of the means of X_1, X_2, ..., X_{p-1} where the weights are a_1, a_2, ..., a_{p-1}. The above is correct only on the condition that there was a unit vector in model B. Note however, that if one version of B does not include a unit vector but does include a set of mutually exclusive and exhaustive binary vectors of which the unit vector is a linear combination, we will simply state that the conceptual raw score model did, in fact, include the unit vector as X_p since the introduction of this linear combination into the predictor set will not change the predictive efficiency of the system nor the obtained set of predicted scores and error scores.

The normal flow then is to input a set of raw data consisting of X_c and X_1, X_2, ..., X_{p-1} (not the unit vector), compute an inter-correlation matrix for these variables, specify one of them as a criterion and identify a set of predictors and call the [illegible] or [illegible] regression subroutine.

To review what happens, the [illegible] regression routine uses an inter-correlation matrix as input, solves a system of equations to a close approximation to give a set of "standard partial weights", and then converts the standard weights into a corresponding set of raw score weights and a regression constant a_p. As you will have noted, both the standard weights and raw score weights are reported on the output.

The net effect of the above is that when you specify the set of variables which are to be inter-correlated and used as input to the regression routine, it is not necessary to list the unit vector as one of those variables. The fact that the regression routines uses correlations as input implies that your conceptual raw score model did contain a unit vector. If you do list the unit vector as a variable to be inter-correlated along with other predictors, its correlations, although mathematically undefined will all be set to 0. This being the case, its weight will never be corrected away from 0 during the iteration sequence, and its standard weight will therefore be reported as 0. So will its raw score weight. However, the regression constant will undoubtedly be non-zero, but this will be for the unit vector which was implicitly in the conceptual raw score model anyway. Thus, if you list a unit vector as part of your input variables to the correlation routine, you will not hurt anything since it will have absolutely no effect on the solution which will be obtained by the regression routine. On the other hand, the listing of a unit vector as an input variable to the correlation routine is simply not necessary. You will get a weight for a unit vector even though you have not listed it as input to the program, and this weight will be the reported regression constant.

****DATA CARD FORMAT****

Cols.

1 - 2 Card Number (1-60)

....Three Service Problem - One Way Analysis of Variance (N=9)

26 Group Number 1,2,3 = Army, Navy, Air Force
28 1 if Army; zero otherwise.
30 1 if Navy; zero otherwise.
32 1 if Air Force; zero otherwise.
34-35 Criterion - AFQT Scores

....2 X 3 Analysis of Variance (N=60)
Hayes - *Statistics for Psychologists*,
Holt, Rinehart and Winston, 1963, P. 435.

4 1 if row 1, 2 if row 2.
6 1, 2, 3 for columns 1, 2, and 3.
8-9 Criterion

....Prediction Problem (N=60)

11-12 Criterion - Typing Speed
14-15 Predictor 1 - Hours of Practice
17 Predictor 2 - Finger Dexterity

....Covariance Problem (N=12)
Edwards - *Experimental Design in Psychological Research*
Holt, Rinehart and Winston, 1968, P. 336

19 Group Number - 1, 2, 3
21 Covariable
23-24 Criterion

....Quadratic Covariance Problem (N=60)

66 Group Number - 1,2
68-69 Criterion
71-72 Covariable

DIRECTOR'S COMMENTS AND EVALUATION

The preliminary arrangements and communications for this presession proceeded quite smoothly. The information blanks that were originally mailed to the applicants for participation were not appropriate for this particular presession. Further information was requested from those members who were finally selected. It would have been desirable to have had information about the computer background of all of the applicants for the presession. It might be appropriate to allow the directors of the various presessions the opportunity to suggest the information to be received from applicants.

The implementation of the computer programs at the IBM data center provided quite a challenge for our staff. However, late Friday just prior to opening the presession we were able to implement the necessary programs. This situation was caused by the development and introduction of a new FORTRAN compiler system by the IBM data center. Everything was ready as planned on the morning of the first meeting.

The facilities provided by th IBM Corporation were quite exceptional and the quality of the classrooms facilities as well as the keypunch and computer facilities were probably better than we could have had at any other location. A few of the participants mentioned the high quality of the physical facilities; however, it is felt that most of the participants did not really express an appreciation of the outstanding computer and classroom facilities that were provided.

One of the most important inadequacies of the arrangements was the housing for the participants. The Penn-Garden Hotel was quite rundown and certainly not appropriate for the price that was paid. It would have been better to have the housing facility quite near the meeting place. I am sure that we could have obtained better housing for the money and also been located closer to our meeting place. It is hoped that if a presession is held next year we will be able to meet in a location that is designed to be convenient to the meeting facilities. I think that the participants would prefer to live near the precession site for 3 days and then move to the convention location.

The staff of the precession had extensive discussion prior to the precession concerning the appropriateness of prior distribution of the text to be used. We are still not sure whether or not it is wise to send out the text in advance. A few of the participants indicated that they would prefer having the text in advance and I am quite sure that it would make very little difference in our approach.

A few people mentioned their inability to absorb the material at the pace that it was presented. It may be more appropriate to spend more time on fewer topics rather than to attempt to cover lightly some of the chapters. Perhaps chapters four and six of the text could be discussed very briefly.

In the future 3 day precessions it will probably be wise to minimize the keypunching required by the participants. We would hope to smooth out the use of the computer by cutting down on the keypunch requirements.

At the end of the precession each participant was asked to write his own comments regarding the precession. I am enclosing copies of all of the comments that were written and I think that you can read them yourself to get some idea of the participants reactions. When you have finished with the comments by the participants I would appreciate your returning them to me since they may be useful in the future evaluation that is being considered by John Williams of the University of North Dakota.

I think that John Williams' interest in the long-term follow-up study is quite appropriate and I have some information that will indicate the extent to which this precession has a long-term affect. I am enclosing a collection of requests that we have received up to the present time. Most of these requestsare a direct result of the participation in this precession. It is hoped that the requests for the subroutine system will result in extensive use of the precession approach at the various universities.

At the present time it is planned to have next year's procession at Northwestern University. James Rigby, one of the participants of this year's procession, has made arrangements for Northwestern University to furnish computer and meeting locations. Our staff is looking forward to next year's procession and we hope to incorporate some of the suggestions that were made this year.

D I S C U S S I O N   VI

STRATEGIES OF RESEARCH WITH CULTURALLY DEPRIVED CHILDREN

Director

Dr. Martin Deutsch
New York University
New York, New York

INTRODUCTION

The Presession entitled Strategies of Research with Culturally Deprived Children was designed for school and university personnel responsible for formulating, planning, conducting, and/or evaluating educational programs for the disadvantaged.

The activities of this Presession were of two types. One type included classroom demonstrations, lectures, and exercises related to the objectives listed below. The second set involved field trips to deprived areas of New York City in cooperation with local agencies working with deprived groups, and consultation and interviews with representatives of such groups. The latter group of activities provided the participants an opportunity to directly observe the environmental conditions of deprivation among several groups as well as providing the opportunity to explore with representatives of these groups, the underlying causes of these conditions and techniques for alleviating them.

OBJECTIVES

Upon successful completion of the program participants were to be able to:

1. Describe in operational terms the major causes of cultural deprivation and the social conditions associated with deprivation.

2. Specify the social conditions and causes of deprivation unique to each of the major groups of deprived peoples within the society.

3. Specify practical experimental treatments having a high probability of reducing or removing causes and conditions of cultural deprivation.

4. Specify research techniques and strategies appropriate for use in experimental research with culturally deprived children, and describe the application of the techniques and strategies to existing problems of culturally deprived groups.

5. Prepare a research outline that describes in operational terms the existing problem, the dependent and independent variables, and the experimental procedures in a proposed experimental study with culturally deprived children.

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NAME	PRESENT AFFILIATION AND ADDRESS	NATURE OF WORK
Sebastian, Lois P.	Temple University, Philadelphia, Pa.	Learning Specialist, Assoc, Prof. of Education and Psychology
Staples, Leonard A.	Board of Education for the City of Hamilton Research Services Dept., Special Services Branch, 357 Hunter St., West, Hamilton, Ontario, Canada	Supervisor of Research Services - includes both elementary and secondary schools
Tanaka, Masako N. (Mrs.)	Dev. Research Division, Education Testing Service, Princeton, New Jersey	Working on project involving cognitive development in nursery school and kindergarten children
Thompson, Sister Mary St. George	Mundelein College, 6363 Sheridan Road, Chicago, Ill 60625	Ass't. Prof. Dept. of Education, Director, Project UPWARD BOUND Summer '65 - assistant teacher in Headstart
Uhl, Norman P.	Emory University, Atlanta, Ga. 30322	Research in comparing characteristics of socially advantaged and disadvantaged elementary school children - Director of Office of Testing and Evaluation; Asst. Prof. in Education and Psychology
Westby-Gibson, Dorothy F.	San Francisco State College, 1600 Holloway Ave., San Francisco, Cali. 94132	Professor of Education - Project Team Member for Far Western Laboratory for Educational Research and Development
Williams, Robert E.	University of South Alabama, 307 Gaillard Drive, Mobile, Alabama 36608	Coordinator for the Division of Education, for Project Mobile - designed to upgrade the competency of selected teachers
Wilson, James Brian	Univ. Of Pittsburgh, 2633 C.L., Pittsburgh, Pa. 15213	Consultation work with the Washington, D.C. public schools, model school division on problems of organization and implementation of non-graded primary and intermediate team teaching instruction
Wilson, Lois J.	New York State Teachers Association, 152 Washington Avenue, Albany, New York	Has primary responsibility for implementing the research phase of equal educational opportunity project, including coordination of publications on project
Withall, John	Pennsylvania State University, Chambers Bldg., University Park, Penna. 16802	Developing a program and policy guidelines for the education of the culturally disadvantaged
Wood, Mary L.	U.S. Office of Education, 400 Maryland Ave., Washington, D.C.	Evaluation and supervision of Title III projects in Northeast programs related to metropolitan planning and problems of urban education

Woolner, Rosestelle B.	Memphis State Univ., School of Education, Memphis, Tennessee	Regional Training Office, Head Start - involved in research related to preschool education for the culturally deprived
Gezi, K. I.	Chico State College, Division of Education and Psychology, Chico, California	Instructor for teachers of the culturally deprived; co-author and author of two books
Wood, Frank H.	University of Minnesota, 103 Pattee Hall, Minneapolos, Minnesota 55455	Assist Prof. of Education, Psychology-teaches graduate level courses on education and characteristics of disadvantaged-Direct Nat. Teachers Corps program

SCHEDULE OF ACTIVITIES

Saturday, February 11

10-11 Registration and Coffee

Introduction to Presession

Dr. Martin Deutsch, Professor and Director
I.D.S., School of Education, New York University

Conference Coordinators:

Dr. Leo S. Goldstein, Senior Research Scientist,
I.D.S., School of Education, New York University

Mr. Eddie G. Ponder, Research Scientist and Director,
Extra-Mural Training Programs, I.D.S., School of
Education, New York University

Miss Barbara Wich, Assistant Research Scientist,
I.D.S., School of Education, New York University

Greetings

Dr. Milton Schwebel, Dean and Professor of Education,
School of Education, New York University

Dr. Alfred Ellison, Chairman, Department of Early Childhood
and Elementary Education, New York University

12-1 Lunch

1:30 Research Design of the I.D.S. Longitudinal Enrichment Program

Dr. Leo S. Goldstein

Pupil Abilities Inventories

Mr. Allan Coller, Associate Research Scientist,
I.D.S., School of Education, New York University

7-9 Assessment and Instruction: Removing the Gap

Dr. Lassar Gotkin, Senior Research Scientist,
I.D.S., School of Education, New York University

Sunday, February 12

Statler-Hilton Hotel - 7th Ave. & 33rd St. - PE6-5000
East Room

10-12 Classroom Observation Scales

Dr. Harold Wilensky, Consultant to I.D.S.,
School of Education, New York University

12-1:30 Lunch

1:30-3:30 Perceptual Development

Dr. Cynthia Deutsch, Senior Research Scientist,
I.D.S., School of Education, New York University

Monday, February 13 - East Room

10-12	Language Development Dr. Vera Johns, Ph.D., Consultant to I.D.S., School of Education, New York University
12-1:30	Lunch
1:30-3:00	The American Indians and Deprivation Dr. Vernon Haubrich, Professor of Educational Policy Studies, University of Wisconsin, Madison, Wisconsin
3:00-3:15	Break
3:15-4:45	Studies of Socialization and Social Behavior in Early Childhood - I Dr. Susan Millman, Research Scientist, I.D.S., School of Education, New York University Mr. Bert Brown, Research Scientist, I.D.S., School of Education, New York University
7-9	The Reading Prognosis Test I.D.S. Reading Program Mrs. Jacqueline Stuchin, Associate Research Scientist, Curriculum Developer, I.D.S., School of Education, New York University

Tuesday, February 14

9-12	Dr. Martin Deutsch Underdeveloped Potentials of Disadvantaged Children: Special Emphasis on Southern Appalachian Children Dr. Perley Ayer, Professor of Sociology, Berea College, Berea, Kentucky; General Chairman, Council of Southern Mountains, Inc.
12-1:30	Lunch
1:30-3:00	Race and Social Class as Related to Language Development Dr. Martin Whiteman, Consultant to I.D.S., School of Education, New York University
3:00-3:15	Break
3:15-4:45	Studies of Socialization and Social Behavior in Early Childhood-II Mr. Richard Colemen, Associate Research Scientist, I.D.S., School of Education, New York University Mrs. Abigail Sher, Assistant Research Scientist, I.D.S., School of Education, New York University
7:30-9:30	Prediction of Achievement Behavior, Sex Differences and Expectancy of Reinforcement Dr. Virginia Crandall, Senior Investigator, Fels Research Institute, Yellow Springs, Ohio

Wednesday, February 15

9-12	The IDS Enrichment Program Overview Miss Edwina Meyers, Associate Research Scientist, Training Instructor, I.D.S., School of Education, New York University The Program - Enrichment Supervisory Staff Mrs. Laura Schneider, Associate Research Scientist, Curriculum Supervisor, pre-kindergarten, I.D.S., School of Education, New York University Mrs. Fay Fondiller, Associate Research Scientist, Curriculum Supervisor, kindergarten, I.D.S., School of Education, New York University Mrs. Sandra Bangsgaard, Associate Research Scientist, Curriculum Supervisor, first grade, I.D.S, School of Education, New York University Mrs. Joan Ehren, Associate Research Scientist, Curriculum Supervisor, second grade, I.D.S., School of Education, New York University Mr. James Reed, Associate Research Scientist, Curriculum Supervisor, third grade, I.D.S., School of Education, New York University Parent Program Miss Edith Calhoun, Director of Social Services, I.D.S., School of Education, New York University Extra-Mural Training Program Mr. Eddie G. Ponder Disseminations Dr. Richard Ellis, Research Scientist, pre-kindergarten, I.D.S., School of Education, New York University
12-1:30	Lunch
1:30	Dr. Martin Deutsch

SUBSTANTIVE DESCRIPTION OF SESSIONS

Saturday, February 11

Research Design of the Institute for Developmental Studies Enrichment Program - dealt with the nature of the longitudinal program, from pre-school through grade three, which the Institute is conducting in cooperation with the New York City Public Schools. Criteria for selection of both experimental and control children for the program, test administered and tentative findings were presented to participants.

Pupil Abilities Inventories - stressed the experimental work of the Institute in developing inventories to shed light on the abilities of disadvantaged children as they enter the school situation.

Assessment and Instruction - provided participants with procedures by which assessment can facilitate instruction without undue loss of time. Stress was on principles of programmed instruction as related to teacher behavior.

Sunday, February 12

Classroom Observation Scales - These scales represent the Institute's work in observing child-teacher interaction as a way of developing teacher competence in the classroom setting. In addition, scales were discussed which were designed to shed light on the child's interaction with materials within the classroom setting.

Perceptual Development - dealt with the role perception, both auditory and visual, as related to cognitive functioning and as the necessary pre-requisites as related to reading. (auditory and visual discrimination). New findings from geneticists was also presented and discussed. In addition, the alphabet board film developed at the Institute for Developmental Studies was shown to illustrate perceptual principles as related to isolation of stimuli and the need for appropriate sequencing for children in the learning process.

Monday, February 13

Language Development As Related To Social Class - Special reference was on the language of disadvantaged children.

The American Indians and Deprivation - provided participants with an opportunity to look at another segment of the American population and the debilitating effects of the Indian reservation as related to the mainstream of our society.

Studies of Socialization and Social Behavior In Early Childhood I - dealt with self-concept of young children considered to be disadvantaged.

The Reading Prognosis Test - developed at IDS was discussed relative to its diagnostic value in working with young children considered to be disadvantaged in the area of reading.

Tuesday, February 14

Underdeveloped Potentials of Disadvantaged Children - dealt with another segment of the American population considered to be disadvantaged: Southern Appalachian children. Discussion centered around the commonalities and differences of children considered to be disadvantaged across racial, social and ethnic social class lines.

Race and Social Class As Related to Language Development - continuation of Monday, February 13 discussion concerned with the language of disadvantaged children.

Studies of Socialization and Social Behavior In Early Childhood 2 - dealt with child rearing practices across social class lines. Dr. Martin Deutsch closed the session to clarify issues based upon previous presentations and developed the topic of cognitive development.

Prediction of Achievement Behavior, Sex Differences and Expectancy of Reinforcement - dealt with the research of Dr. Virginia Crandall and her late husband as related to this topic.

Wednesday, February 15

In the morning some participants were provided opportunities to visit in schools. They observed Institute for Developmental Studies Enrichment Program classes, pre-kindergarten through third grade, and the New York University Junior High School in Brooklyn, New York.

IDS Enrichment Program - stress was on the practical application of the research sessions of the presessions as related to program development.

Summary - Dr. Martin Deutsch

In the afternoon a group of participants met with Dr. Leo S. Goldstein of the IDS staff who were interested in proposal writing and research designs as related to working with the disadvantaged. Still another group of participants met with Dr. Alfred Ellison, Chairman of the Department of Early Childhood and Elementary Education and other members of the Department whose specialty is teacher education to discuss training programs for teachers of the disadvantaged.

SAMPLE MATERIALS

Research Design of the IDS Enrichment Program

'62-'63 Samples	Year	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70
	Grade	Pre-K	Kgn	1st	2nd	3rd	4th	5th	6th
E		X	X	X	X	X			
C_{ss}		-	X	X	X	X			
C_k		-	X	X	X	X			
C_1		-	-	X	X	X			

'63-'64 Samples	Grade	Pre-K	Kgn	1st	2nd	3rd	4th	5th
E		X	X	X	X	X		
C_{ss}		-	X	X	X	X		
C_k		-	X	X	X	X		
C_1		-	-	X	X	X		

'64-'65 Samples	Grade	Pre-K	Kgn	1st	2nd	3rd	4th
E		X	X	X	X	X	
C_{ss}		-	X	X	X	X	
C_k		-	X	X	X	X	
C_1		-	-	X	X	X	

*

'69-'70 Samples	Grade	Pre-K
E		X
C_{ss}		-

*The blocks for school years '65 through '68 are not shown.

Indians In Two Public School Systems
Deprivation and Disadvantage

Vernon F. Haubrich

The Indian American who is living on a reservation partially as a ward of the Federal Government presents, in many cases, a classic picture of segregated life which is highly deprived and which is legally sanctioned by our society. Adults and children leave the reservation for specific purposes among which are shopping for goods, travel in the immediate area for work and schooling for children.

In both of the communities where beginning studies are being conducted, Indian children attend school with non-Indian children on a fully integrated basis. The schools are off the reservations, except in one case where the Tribe deeded part of the land for a school built by the community. Typically, the child from the reservation is bussed to the neighboring community and then is bussed back after school ends. The situation is not unlike that of several large cities where some children are bussed from one neighborhood to another.

The general economic, social and physical conditions on these reservations are pathetic. The traditions of fishing and minor agricultural pursuits are not sufficient to maintain any adequate standard of living. The homes of the Indians are generally in very poor repair with inadequate facilities for sanitation, heating and water. A state of general depression exists and has existed for a number of years. The etiology of this state of deprivation and disadvantage will be examined later in the paper. Approximately 30% of the Indian families are on public welfare and this is six times the rate for the local community.

The health and welfare of the Indian American in the Pacific Northwest and especially in the two communities under study is extraordinarily depressed. The overriding statistic which blots out all others is the average life span of the Indian. In 1960 the median life span of all Indians was not more than 41 years and in the Pacific Northwest it was not more than 46 years. In essence this means that the Indian child looks forward to approximately 25 fewer years of life than his non-Indian counterpart.

The other statistics follow a dreary trail after this first shocking realization. Indians are hospitalized twice as frequently, Tuberculosis occurs at four times the rate of the whites; infant mortality is triple. One is not reassured by the accurate observation that in the area of health and welfare, conditions have improved in the past 10, 20 or 30 years. All in all, one can say that the circle of poverty, disease and depression has hit home with a vengeance on these people.

The schooling of Indian children plays a critical role in their eventual social and economic disintegration. In no event am I saying that the schools are deliberately creating the conditions of failure and desperation; however, it is in the lack of any clear responsibility for breaking the circle of poverty that the school and other public agencies are partially to blame. If one has a lockstep grade system it is easy to condone failure if children do not meet the "standards"; if one views children as agents of an alien culture, it is easy to blame the home conditions for lack of response.

The statistics related to school drop outs, to attendance rates, and to percentile rankings on achievement and aptitude tests are telling points when looked at in relationship to the generally impoverished state of the Indian families. It is also important to note that the 1963 statistics presented in this paper have not substantially changed from previous years and that the number of Indian children involved has remained essentially constant.

In community A the Indian children comprised 39% of all children enrolled in the first grade (Indian N=18). This figure drops to 3% in the 9th grade and there are no Indian children enrolled in grades 10, 11 or 12. By the end of the 4th grade, 65% of the Indian children and 5% of the non-Indian children have failed at least one grade.

In community B the Indian children comprised 33% of all children enrolled in the first grade (Indian N=34). This figure drops to a low of 3% in the 12th grade. By the end of the 4th grade, 46% of the Indian children and 5% of the non-Indian children have failed at least one grade.

In both communities the decline in enrollment of Indian children is steady and constant with sharp drops in enrollment at the 7th and 9th grade levels. In several other communities preliminary data indicate the same kind of steady drop with few remaining to the end of the 12th grade. It should be noted that the issue of Indian children being in the majority or minority has little to do with the drop-out problem. In one community where Indian children are in the majority 95% of the first grade children are Indian and this declines to 11% of the 12th grade.

The number of days absence per year ranges, for Indian children in community A and B, from double the rate to four times the rate of the non-Indian. There is little question that teachers view the low achievement and failure rates as directly related to the disproportionately high absence rates.

Reading tests for both communities indicate that Indian children begin the first grade less able to begin the reading program than non-Indian children. Reading tests given during the first grade indicate a range in percentile scores from the 78th to the 5th percentile for Indian children with a median at the 21st percentile. Non-Indian children range from the 97th to the 45th percentile with a median at the 80th percentile.

In 1960-61 Roger Karrigan, a teacher from a Washington public school district, collected data which substantiates and enlarges upon the data which we are gathering at this time. At that time he found the following:

1. There was a disparity of 24 points in medial IQ scores of the Indian and non-Indian children (84-108).
2. In 1960 over 50% of the Indian children were retained in the first grade of community A.
3. The average daily attendance was 20 days less per year for Indian children as compared to non-Indian children.
4. On tests administered to the 9th grade, verbal reasoning, numerical ability, abstract reasoning, spatial relations, clerical speed, mechanical reasoning and language usage, percentiles indicate that Indian children did not score higher than non-Indian on any test and on only one test did Indian girls score the same in percentile rank as non-Indian girls (spatial relations).
5. On none of the scores did Indian boys score higher than Indian girls.
6. The scores of Indian boys in verbal reasoning, abstract reasoning, mechanical reasoning and sentence usage fell below the 15th percentile. Mechanical reasoning fell at the first percentile.

7. In the first three grades of school 60% of the Indian children failed one grade or more.

8. As the Indian child proceeds through schools he falls progressively further behind. The mean grade equivalent difference between Indian and non-Indian children at the 5th grade is .1 of a grade. By the 9th grade this has gone to a difference of 2.7.*

One of the areas in which we are gathering data is the pre-school and early school social and readiness factors related to later school failure. During the summer of 1964 a private agency conducted an integrated pre-school (Indian children predominate; Indian N=18, total N=22) class in the school of community A. During this time we were allowed to observe, record notes and data and do extensive interviews with children and the teacher. This material is most valuable when one views the normative data of later school failure and depressed aptitude and intelligence scores. The teacher of the class is a regular nursery school teacher in the city of Seattle and was able to compare her usual classes during the year with the children in this nursery school. Additionally she had four non-Indians in the class.

The following are summaries of her observation records and observations we made on the scene.

1. The Indian children were deficient in listening skills, could not handle group discussion and were deficient in language facility when compared to non-Indian children.

2. Of the 18 Indian children, 17 had no experience with painting, dough play, finger painting, or handling of these materials. The nursery school time was spent learning the rudiments of these materials. The children were unfamiliar with crayons.

3. Approximately 3/4ths of the group of Indian children did not utilize any of the books which were available, either before or after being read to by the teacher.

4. The concept of a daily task was foreign to the children. The notion of each child sharing in the passing of the daily cookies and juice was not understood. By the end of the summer, 1/3 of the children did pass the cookies and juice when asked, 1/3 volunteered to pass and 1/3 did nothing.

5. The concept of a group leader lining up for outdoor play and orderly procedures for exit and entrance was foreign to the Indian children.

6. Eating habits of the Indian children were sporadic; set times for food seemed to be unknown to the Indian child.

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*Karrigan, Roger, Unpublished M. Ed. thesis, University of Washington, 1961.

7. Many of the Indian children were closely related by marriage and blood and the teacher was viewed as the outsider.

8. The Indian children had a strong sense of independence. They could dress, toilet, wash and care for themselves. Playground activity and disputes were settled by the children, usually without the teacher's intervention.

9. The children gave evidence of strong withdrawal when extensive speech patterns were used by the teacher. The children used very simple phrases when they spoke at all.

10. The idea of "clean-up time" was foreign and the children did not pick up toys, boxes, blocks, etc. This caused the teacher some concern.

11. Transfer was apparently nil; activities taught and apparently "mastered" were not sought out by the children on the following day. The teacher engaged in much repetition and explication of identical activities.

12. The teacher's judgment and ours was that the children would experience great difficulty in their beginning reading program.

13. The Indian children did not have a "questioning syndrome".

14. There was a great deal of solitary play on the part of the Indian children.

15. The teacher's judgment and ours was off by at least one year on the ages of the Indian children because of their smaller physique and size.

16. The children gave evidence of placing a great value on certain things (they would not remove shoes for rhythms).

17. The Indian children had little "group empathy" for non-Indian children.

18. There was little volunteerism in play or activities on the part of the Indian children.

19. Many items in the room were completely foreign to the Indian child.

20. Some social habits, dunking the cookies, for instance, immediately set the Indian child apart from the non-Indian child.

21. Group singing was foreign to the Indian children.

22. There was little of the initiating, organizing, and competitive attitude.

It is difficult to summarize the difference that existed between the Indian and non-Indian children. By and large, one had to note the variance between the "things" in the room and the relatively little acquaintance the Indian children had for these things. For example, an easel or clay was a completely foreign object to the Indian children.

There was little of what teachers are prone to call "cooperation" on the part of the Indian children. On one occasion the teacher said to a child who had been somewhat too strong-willed for her, "You can go and come back when you are ready." Of course, the child never came back. They have little background in following directions or in the general concept of "a place for everything and everything in its place".

The lack of competitive drive is, on all counts, a strong element in this particular Indian subculture. Teachers learn early that if an Indian child connot answer a question in class discussion, in many cases no other child will volunteer for fear of embarassing the first. The entire range of getting, driving, organizing and initiating activities are largely absent from the life of the Indian child before he comes to school.

The alienation syndrome which is caused by the lack of communication between the Indian culture and neighboring white culture, the failure of an industrial competitive society to make an impact on the segregated ghetto of Indian life, the residue of discriminatory attitudes on the part of communities and agencies within these communities, the total withdrawal of most Indian children in school, grade by grade, is one that is predictable and reliable. This syndrome is reinforced by the number of Indian males who abandon their families for long periods of time, causing a further depression to occur.

The effects of a ghetto life, a culture which is different in many but not all respects, the impact of a socio-economic depression and the lack of a coordinated attack on these problems has caused much misery, disease and early death for these unfortunate people. The choices in this situation are, to me, relatively clear. One can continue to do what has been done and live with the situation as best we can - or a concentrated effort can be made to bring these Indians into the 20th Century. This case study indicates the impossibility of maintaining both an open, free and competitive society and any form of ghetto life which shuts people from the larger society.

The costs of this effort will be high; schools must begin early training of children and mothers, radical measures must be taken to end the ghetto of the reservation; teachers must be retrained and equal employment must be enforced. It is almost axiomatic that the lack of effective political power mitigates against the mounting of this necessary full-scale attack. What is required in this situation is a desire to do those things which must be done for the sake of human beings who need our help.

ASSOCIATED PUBLIC SCHOOL SYSTEMS

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the ambience of poverty

In discussing the characteristics of the disadvantaged child, we must remember that this particular child is a human being, capable of the varied human responses which ultimately can be channelled into the kind of productivity necessary for the welfare of our country and society. Too often, labels such as "disadvantaged," "culturally deprived" and "underprivileged" distort the fact that we are talking about human beings who are usually capable of developing into productive citizens if we have the attitudes, commitment and skills to make this possible. One hears much about the need for people

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Following an analysis of the social and psychological characteristics of disadvantaged children, Eddie G. Ponder, also a research scientist at the Institute for Developmental Studies, suggests the implications of this information for schools.

in the lower socio-economic strata of the population to develop positive self-concepts and yet, current terminology tends to reinforce their negative self-concepts.

The social and economic characteristics of the disadvantaged are specific. Most of the disadvantaged people live in deteriorating, over-crowded, noisy apartment buildings. The area in which they live usually has the highest rate of economic dependency in the city. Because our technological society has made great advances, and because people in the lower economic strata do not have the skills necessary to cope with the technological advances, these people are economically at a disadvantage. And, generally, the adult population is at a low educational level. Moreover, this can be related to the prevalent family unemployment which, in turn, is related to the frequency of family breakdown. Family breakdown in this segment of the population usually results from the inability of a man to obtain work by which he can adequately support his family.

In order to keep the family economically intact, parents must work for a longer period each day. They generally have two jobs that pay low wages. The concept of the extended family is useful in discussing parents' long working hours because grandfathers, grandmothers, aunts, cousins or other adults are often needed to supervise during the parents' absence. Child-neglect on the part of the parents in disadvantaged areas is a result of the necessity for them to be away from home longer in order to secure minimal wages.

While the disadvantaged area yields numbers of "delinquent" children and young adults, juvenile delinquency is not confined to disadvantaged areas or lower-class neighborhoods. One has to consider conditions in slum areas which produce or allow delinquency, and keep in mind that it is also rampant in some of the most affluent areas of the country. Yet the affluence is a façade which conceals the amount of delinquency present in such areas; statistics do not show the actual number of children and youth from affluent areas involved in acts of delinquency. Acts often labeled delinquency in low-income neighborhoods are termed "childish pranks" in the affluent areas.

What is usually considered apathy towards school on the part of both parents and children in disadvantaged areas must be examined carefully. While it is true that apathy exists between parents and school (on the part of both the schools and the parents), one has to distinguish between apathy towards school and apathy towards education.

The disadvantaged are apathetic towards school because school personnel in disadvantaged areas have not built the kind of positive interpersonal relations and communication between themselves and the disadvantaged community which facilitate positive attitudes toward the school as a helpful institution. Because many of the parents have inferior self-images, and because their school experiences were unsuccessful, they do not believe the personnel of the school have any positive feeling or confidence in them or their children. This, then, tends to alienate the school personnel from the community it should serve. On the other hand, parents of disadvantaged children are not apathetic toward education. They realize the necessity of a good education, but they do not seek proper guidance because they think that no one is interested. The school has also failed to offer guidance and information to parents and their children which could more realistically help them in the assessment of their potential and the appropriate resources for its development.

In discussing psychological phenomena, one must remember that present standardized tests used for testing these children do not yield sufficient data on which to generalize for most of the children. However, psychological testing is useful as one means of determining children's strengths, weaknesses and levels of functioning during a given test. Subsequent tests can be administered to observe movement both progressively and regressively. Psychological testing and research findings over the years have found the following general characteristics of children living in disadvantaged areas. One has to keep in mind that these characteristics are not limited to disadvantaged children and are on a continuum with respect to most children.

1. **Weak Perceptual Foundations.**

   Children in disadvantaged areas are deficient in the perceptual modalities, both auditory and visual. Coming from large, noisy, crowded apartments and homes, these children seem to develop the skill of "tuning out" as well as the inability to visually discriminate. Children in rural areas may have similar problems because of lack of sufficient sensory stimuli.

2. **Poorly Developed Concepts.**

   Because they lack adequate experiences in the perceptual areas and in language development, these children generally do not have concepts commensurate with their ages and abilities. Sometimes they can label a few of the individual items which make up a concept (apples, turnips) but cannot label the concept itself (fruit, vegetable). These boys and girls appear to have problems with classification, categorization and grouping.

3. **Lack of Verbal Labels for Common Objects.**

   The language of disadvantaged children is underdeveloped, but this does not mean that disadvantaged children are incapable of developing full and adequate vocabularies. The low educational level of the parents, and the child's particular social environment, do not facilitate his language development. All children learn language from people around them and more specifically, from the mother. If the mother does not have adequate verbal labels at her disposal, or if she does not take the time to supply the labels to the child, the child's vocabulary will not be developed to its fullest capacity by the time he enters school. The language model, then, is of great importance for all children since it is one primary source of developing language.

It should be understood, however, that the disadvantaged child does have adequate language relative to his particular social milieu. Unfortunately, much of the language that he utters and hears in his social environment does not communicate in the mainstream of our society. Moreover, the language that he speaks is not in terms of school expectancy, commonly called "school language!" He typically speaks at the lowest level of language (vulgar level), which often obstructs communication between the child and the teacher. According to many language arts specialists, language for purposes of classification is delineated into four levels. Lowest to highest, the levels are: vulgar, colloquial, American standard and literary. If the teacher is to build on the language possessed by most disadvantaged children, he must not only accept this language, at the vulgar level, but understand it. This will facilitate communication and help the children engage in other ways of speaking the language. The school should not try to eradicate the language with which the child enters the school situation, but rather, to extend or build upon the language he possesses.

Speech patterns can also cause frequent misunderstandings between teacher and child. Since this is the age of great mobility of the population, teachers need to be aware of the regional speech patterns with which their children come to school. The teacher, if he is aware of these patterns, can facilitate children's language development by helping them develop other ways of using and manipulating the language.

4. Short Attention Span.

One has to consider the concept of the short attention span from two points of view: home and instructional. Often children have short attention spans because they have not been trained to complete a variety of tasks in the home before they enter school. Perhaps an older sibling has been responsible for the supervision of the children in the absence of adults and therefore has not trained them to follow through on certain tasks. Even when parents are at home with their children they are too concerned with the basics of survival to assign tasks to their children or hold them responsible for their completion. As a result, the child develops his own independence according to his desire to complete the task assigned. When these children enter the school situation, they are not ready for tasks which do not permit them to stop when they see fit. Therefore, the teacher should be aware of the child's home conditions in order to develop his attentional and attending skills in the school situation. The teacher may need to prepare for the child a variety of short-term activities in which the child can be successful and systematically increase not only the level of difficulty but the time-span.

Too often, however, the short attention span disadvantaged children have is due to the meaningless instructional program offered them. The level of instruction and the selection of materials are either too difficult or too easy, and what is often termed "short attention span" is pure boredom on the part of the child. Much of the short-attention-span problem could be resolved if the teacher provided more appropriate materials and activities during the school day.

5. Poor or Non-Readers.

A problem that invariably arises when one discusses the disadvantaged child is that of reading. For example, the Great Cities School Improvement Program, subsidized in part by the Ford Foundation, found that reading was the major problem faced by disadvantaged children. However, for many of the children, reading should not have been the first concern, but rather those prerequisite skills related to reading. Strengthening and shaping prerequisite reading skills could ultimately make reading possible for the children.

6. Meager Backgrounds of Information.

In terms of standardized testing, many of the children may evidence meager backgrounds of information. Frequently, if the test questions were communicable to the child, the answers required would probably be obtained. These children have much information at their disposal, and testing is only one way of finding out the particular information that they possess. When one pursues other ways—observation of and interaction with the child—of finding out what children know, one usually gets a more positive picture.

7. Poor Self-Image.

A child of lower-class status, and frequently of a racial or ethnic minority, tends to have a low self-image. It is very important that the school look for a variety of ways to help the child develop a positive self-image. The school must provide an environment and materials which facilitate the child's feeling of confidence and competence. A positive self-image becomes of crucial importance if we are to develop the child's cognitive and social skills.

Compensatory education for disadvantaged children will be necessary, not only at the pre-school level but through the twelfth grade, if the schools are to succeed in educating all disadvantaged children to their optimal capacity. To accomplish this, the following considerations are necessary:

1. A variety of manipulative and concrete aids in the instructional program.
2. Compensation for deficiencies on the part of the students in the critical areas of auditory and visual perception, language, concept-formation and self-image.
3. New approaches in the development of language facility through the experiential or oral approach. The structured approach to language for the disadvantaged, such as using selected methods of learning a second language (audio-lingual approach), seems to offer promise.
4. More adequate intelligence tests to help determine the potential of the children.
5. Involvement of the community-at-large as individuals, groups and agencies in the education of these children.
6. Flexible programming in the schools with different administrative and instructional styles such as team-teaching, ungraded plans, multiple-age grouping, large blocks of time instruction (core-curriculum), individualized instruction, etc.
7. Assignment of more special personnel such as school psychologists, social workers and guidance counselors to assist principals and teachers with better understanding and more counseling of disadvantaged children.
8. Encouragement of book publishers to develop materials which depict minority groups in a more favorable light and as a part of the mainstream of American history and society.
9. Provision of ego models for disadvantaged children and especially racial minority groups in order to increase their motivation for developing into productive selves.
10. Cooperation with colleges and universities in developing both in-service and pre-service programs for teachers assigned and training for assignment in schools in disadvantaged areas.
11. Training of all teachers, Kindergarten through twelfth grade, in the field of reading. This will facilitate the continuous growth in reading on the part of disadvantaged children.
12. Encouragement of philanthropic organizations, business, industry and other individuals and groups to provide scholarships for deserving, needy and promising students who should continue their education both into and beyond high school.
13. Cooperation with community agencies. Many of the problems of disadvantaged children are not school-centered. Greater help must be given to the schools by such agencies as Family Service, Health and Welfare Agencies, and Guidance Clinics. In addition, there should be greater coordination and mobilization of community resources.

ASSESSMENT SHEET

AERA Presession
on
Strategies of Research and Programs for
Disadvantaged Children

Martin Deutsch, Ph.D.

We would like to enlist your aid so that we may develop our Extra-Mural Training Program to best serve the needs of educators and researchers working in the area of the disadvantaged child. As a participant in the AERA Presession conducted by IDS from February 11-15, your responses to the following items will be extremely helpful.

1. Below you will find a list of items included in the Presession. Please rate each of the items in terms of its helpfulness to you by using the numbers 0 through 4, according to the scale below. If you missed an item for any reason, place an A for absent in the space provided.

SCALE

(4) Especially helpful

(3) Very helpful

(2) Moderately helpful

(1) Slightly helpful

(0) Not helpful

(A) Absent

Items	Rating
a) Research Design of the I.D.S. Longitudinal Enrichment Program - Dr. Leo S. Goldstein	______
b) Pupil Abilities Inventories - Mr. Allan Coller	______
c) Assessment and Instruction: Removing the Gap - Dr. Lassar Gotkin	______
d) Classroom Observation Scales - Dr. Harold Wilensky	______
e) Perceptual Development - Dr. Cynthia Deutsch	______
f) Film - Alphabet Board	______
g) Cocktails and Dinner	______
h) Language Development - Dr. Vera John	______
i) The American Indians and Deprivation - Dr. Vernon Haubrich	______

j) Studies of Socialization and Social Behavior in Early Childhood - I
Dr. Susan Millman ______
Mr. Bert Brown ______

k) The Reading Prognosis Test, I.D.S. Reading Program - Mrs. Jacqueline Stuchin ______

l) Underdeveloped Potentials of Disadvantaged Children: Special Emphasis on Southern Appalachian Children - Dr. Perley Ayer ______

m) Race and Social Class as Related to Language Development - Dr. Martin Whiteman ______

n) Studies of Socialization and Social Behavior in Early Childhood - II
Mrs. Abigail Sher ______
Mr. Richard Coleman ______

o) Summary - Martin Deutsch ______

p) Prediction of Achievement Behavior, Sex Differences and Expectancy of Reinforcement - Dr. Virginia Crandall ______

q) The IDS Enrichment Program - Overview - Miss Edwina Meyers; The Program - Enrichment Supervisory Staff, Mrs. Laura Schneider, Mrs. Fay Fondiller, Mrs. Sandra Bangsgaard, Mrs. Joan Ehren, Mr. James Reed ______

2. Please indicate the major reason(s) for your attendance at the Presession.

3. Did the Presession meet with your expectations?

Yes ______

No ______

Please explain.

4. What would you have liked included in this Presession?

5. What would you have liked deleted from the Presession?

6. What suggestions would you make to improve this type of Presession?

NAME______________________________ POSITION______________________________

SUMMARY AND COMMENTS OF THE 1967 PRESESSIONS

PROGRAM DIRECTOR

The Second Annual Presessions were both bigger and better than the First. The presession concept appears to be a highly useful one for upgrading the competence of educational reserarchers. The experience of the 1967 Presessions suggests the following characteristics are necessary for a successful course: intensive, structured, methodological training by highly competent instructors. Further experience with presessions will be necessary to further identify the determinants of success in such training. On the basis of the first two years of experience one can rule out class size (up to 75) and high selectivity of participants as important considerations.

Physical locations for the presessions continue to be a problem. While a successful presession can be conducted at a hotel, the typical hotel is simply not optimal for classroom instruction. The isolated resort appeared to work out quite well in the single trial at such a location. Further exploration of physical arrangements will be necessary.

While the training provided in a presession is much less expensive than the typical university course or institute, it is still expensive. The cost of instructors' time has been reduced to a near minimum. Thus economy in this direction can be gained only by increasing the degree of "packaged" instruction. Continued experience with a given presession course should lead to the development of a base for such instructional packages.

The travel and per diem costs, borne in 1967 by the individual participants, were approximately double the instructional and administrative costs. These costs could be reduced by conducting the courses at locations to which the participants could commute. While such a distribution would stretch the notion of "presessions", the success of the concept suggests that some form of expansion of the concept is inevitable. The 1967 Presessions further demonstrate that the full development of presession-type training for educational researchers has only begun.

Richard E. Schultz, Director